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A Consumers' Conference.

THE series of summer conventions of the various sections of the electrical world opens this week with the fifth annual conference of the Electrical Association for Women.

It is fitting that this Association should claim attention first, since it may now be regarded as the premier consumers' organisation (its membership is not, of course, limited to women) and, whatever the skill and efficiency with which apparatus is manufactured or electricity produced, it is the consumers who will adjudicate on the effectiveness of the work of designers, contractors, and supply engineers. Whether our manufacturers' workshops and our generating stations and mains are to be utilised to the utmost extent will ultimately depend upon our ability to persuade consumers that electricity will best meet their requirements and that its superiority will not have to be paid for too highly.

It has been said that women, generally, are more conservative than men, but that they are more responsive to a mass movement towards the fulfilment of an ideal in which they have faith. The logical inference is that once the belief in the desirability of an all-electric home has been inculcated in the minds of the more progressive women, its development will be very rapid. Be that as it may, it is quite certain that without their active co-operation the use of electricity in the home to the hoped-for extent will remain merely an ideal, since this sphere provides an exception to the rule that he who pays the piper calls the tune.

Advantage is being taken of the convention to mix social enjoyment with more serious aspects. Thus, at the luncheon arranged for yesterday an opportunity was to be given us to understand the particular angle from which electrical development is regarded by several leading men and women. Among those who promised to speak was the Minister of Transport, Mr. H. S. Morrison, and it is pleasing to note the very keen interest that the official representative of the electrical industry in Parliament maintains in its practical applications. A good feature of the programme was the visit to the Home Office Industrial Museum, which was opened in Horseferry Road, London, about 2½ years ago. This museum

is intended to set up a standard of safety in industry, and although the use of electricity in the home is not subject to the Home Office regulations, the underlying principle—adequate prevention of danger—applies with equal force. If the exhibits do nothing more than drive home the idea that good installation work is worth paying for, the visit of the Association, or of individuals at any time, will have been well worth while. The visit to Messrs. J. Lyons & Co.'s factory this morning will enable views thus formed to be referred to practical conditions.

Some knowledge of history is desirable, if only to prevent history repeating itself, and the task of relating the present stage of electrical evolution to its beginnings and growth was to be undertaken by Mr. Llewelyn B. Atkinson in the appropriate setting of the Institution of Electrical Engineers.

The conference will conclude to-night with a ball and cabaret. This function, although in lighter vein, will have its deeper value in bringing together, in an atmosphere favourable to the realisation of a common purpose, all parties whose co-operation is necessary to electrical development—consumers, contractors, wholesalers, manufacturers, and those responsible for the generating, distribution, and sale of electricity.

Enterprising "Beda."

IN the following pages we publish several matters of interest in connection with the operations of the British Electrical Development Association. We may ask that serious thought be devoted to the article contributed by Mr. H. Marryat, chairman of the Council, in which he expresses the commonsense view concerning the need for electricity and its applications to be advertised extensively and effectively. However good a commodity is it can only be sold on the grand scale if the public is constantly and forcefully educated regarding its existence and its merits. We must get away from the little-mindedness which keeps B.E.D.A.'s annual purse at thirty thousand pounds, remembering all the time that we are in a competitive business. Our gas competitor is always alive, alert, and generously financed. Electricity has an Association which is also alive and alert, but is handicapped because it needs more money. May Mr. Marryat's appeal influence the "unbelievers" to whom his remarks are particularly addressed, so that they may feel compelled to come in and help to pay for advantages already received and for others that will follow through their co-operation.

We congratulate the Association on having sent Lt.-Col. W. A. Vignoles, its director and secretary, on a tour of the United States. We are sure that he will be afforded ample facilities by our friends on the other side to secure much information which will assist the Association and therefore the electricity supply industry as a whole, in making increasingly rapid progress in the domestic and publicity fields.

The Shannon Scheme.

ALTHOUGH it is natural to suppose that more enthusiasm would be felt for the Shannon scheme were the plant and works the product of British factories and designers, this feeling should not be allowed to abrogate interest in the technical aspects of a courageous effort, by an important constituent member of the Empire, to exploit its natural resources for the purpose of a wide-spread electrification.

Lt.-Col. Wilfrid Ashley remarked at the official inauguration of the Scottish grid (a report of which appeared in our last week's issue) that we might learn much from the Irish Free State with regard to rural electrification, and it will be evident from the article on the Shannon scheme now running through our pages that the project includes many other features of interest to British engineers. Thus, to deal with the weights of the 30,000-kVA generating sets must have presented difficult problems, and special attention has had to be paid to lubrication. The arrangements for fire-protection are noteworthy, as are also the numerous automatic devices to fulfil a large variety of purposes.

Comparison is inevitably challenged with our own grid, but the conditions are not so similar as might appear at first glance. The Free State problem is not the interconnection of large and efficient steam stations, as it primarily is with us, but the harnessing of the Shannon waters to transmit electricity from one station throughout the entire country. It therefore becomes a question of transmission only, and in many respects is less complex than conditions permit in England and Wales and Scotland. The main transmission voltage of 110 kV—in line with the Continental standard—is lower than our own, but a higher intermediate voltage of 38 kV may compensate for the greater transmission losses in the primary system. It is of interest to note that impedance protection of the lines is to be employed, as in the case of our own grid for longer distances. Although the article which we are now publishing will be of more especial interest to those taking part in the summer meeting of the Institution of Electrical Engineers, in view of the proposed visit to the Shannon scheme on June 4th, we believe it will also appeal to the intellectual interest of all who are concerned in large-scale generation and transmission of electricity and in the utilisation of natural resources.

Portobello Power Station.

THE article penned by Mr. D. S. Munro elsewhere in this issue, describing the recently inaugurated extensions at the Portobello power station of the Edinburgh Corporation, leaves a very strong impression on our mind, or, rather, further impresses an already indelible mark as to the soundness of British engineering, both as regards the manufacturing side and from the supply engineering point of view.

After being redesigned in the embryo stages to permit larger output, the increase of the initial capacity of 30,000 kW, first to 44,000 kW after three years' operation, and then to something approaching 300 per cent. of the initial output after a further three years, without change in basic principles, while maintaining or rather increasing the station efficiency in keeping with modern standards, is an achievement of which Mr. Edwin Seddon, M.I.E.E., the engineer and manager, and his staff should be proud.

The continuance of the original system of stoker boiler firing, with the same steam conditions of pressure and temperature, particularly at a time when there is a strong tendency among supply engineers to plunge for higher theoretical efficiencies by the adoption of pulverised-fuel firing and higher steam pressures and temperatures, denotes great confidence on the part of the undertaking and the manufacturers concerned.

The East-England Scheme.

THE latest scheme of the Electricity Commissioners (particulars of which are given elsewhere in this issue) relates to an area which, electrically speaking, is the "leanest" of those yet covered. The consumption per head (61 kWh) is little more than one-third of the average for the whole country; this poor figure is chiefly due to the low population density in Norfolk and Suffolk, 230 persons per square mile, as compared with 666 for the areas already included in schemes and 485 for the whole of Great Britain. About one-third of the population of East-England is to be found in the five towns with over 20,000 inhabitants, of which Norwich is very much the largest. Norwich power station is selected for operation, but the base load is to be carried by the Great Yarmouth station and extensions thereto. The low cost of sea-borne coal provides the reason for the latter decision, which is based upon the sound principle that the potentialities for economic generation that are inherent in a site should decide the position of a selected station.

It is encouraging to note that even in so unpromising an area capital savings over independent generation are anticipated. Even if this were not so the general benefits of grid supply in a scattered area of this kind would justify its inclusion in the general scheme.

B.E.D.A.— A Word to Unbelievers.

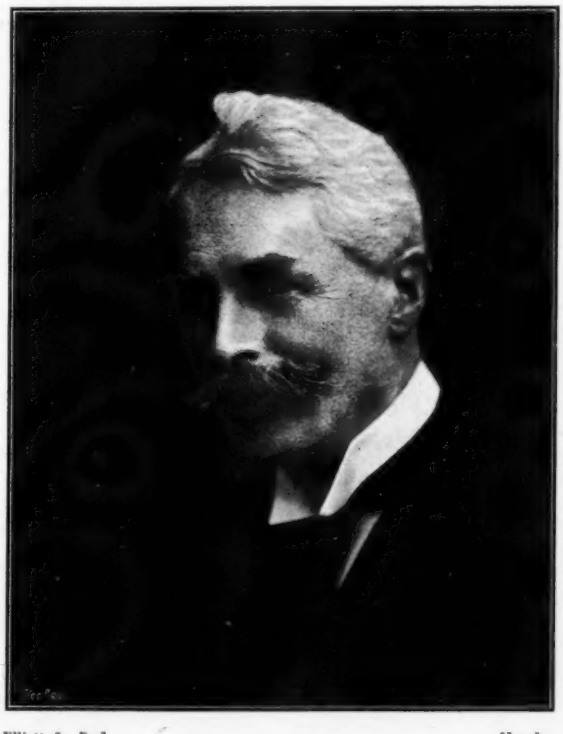
Full support of the Association would enhance its effectiveness out of all proportion to the increase of its income.

By H. MARRYAT, M.I.E.E., M.I.Mech.E.,
Chairman of the Council of the British Electrical Development Association.

I SUPPOSE our natural resistance to progress is biological. Without it we might progress too quickly and exhaust our supply of oxygen or something of that sort. Whatever the cause, it must always be a source of wonder that we take so long to adopt an idea which we know in advance to be sound.

National advertising is an instance. We believe in the principle, but hesitate to practise it.

I have talked this matter over with several of the big advertisers, men who not only believe in the principle of national advertising, but have also tried it. I learn that £250,000 is the cost of putting a single message over effectively to the British nation. The advertising of a firm manufacturing cleaning materials is costing £900,000 per annum, a sum which is expended through a single agency. A west-end drapery establishment is spending £600,000 per annum, while £300,000 represents the cost of popularising a single brand of cigarette. Single campaigns costing £100,000 are comparatively common, and the sum of £30,000 was expended to inform the public that mustard is good for them!



Elliott & Fry] *[London.*

Mr. H. Marryat,
Chairman of the B.E.D.A.

I mention this last figure because it represents rather more than the Electrical Development Association has available each year for the national advertising of electricity. It is, of course, wholly inadequate, and the fact that so much has been done is in itself an outstanding argument for the value of money spent in this way, as compared with far greater sums spent in the cruder method of A, B, and C, each recommending his own goods.

The Association has itself set a very low scale of subscription, one-tenth of one per cent. of revenue. If every concern of importance subscribed upon this scale, the income of the Association would be doubled, and its effective work at least quadrupled. If the scale itself were doubled, as it most certainly should be, the Association with £100,000 per annum available would be able to compete on something like equal terms with its rival organisation, which spends a much larger sum upon popularising the use of gas in the community.

This brings us to a very serious question, that of the concerns which so far have stood aloof from the Association or have subscribed only on part scale.

The organised manufacturers and the contractors support the E.D.A. through their central organisations, and the majority of the supply undertakings are subscribing upon the very moderate scale of one-tenth of one per cent. of revenue, which E.D.A. herself has set, but there is still a great number, comprising some large, but mostly small undertakings, which subscribes nothing, whilst all the time benefiting by E.D.A.'s national advertising and educational policy.

It is true that the number of these laggard concerns is diminished by some 20 to 30 per annum, but the process is slow and manifestly unfair. Because the work of the E.D.A. cannot be localised, those who become members must pay partly for the benefit of those who remain outside.

Apathy seems to be the sole hindrance to the 100 per cent. membership of the supply side of the industry which is urgently needed. Members, including some of the largest concerns in the country and therefore the biggest subscribers, are not merely satisfied, but are enthusiastic over the result of E.D.A.'s activities. The reason that some do not co-operate can only be that they do not correctly understand what is going on. An intensive campaign to educate engineers, chairmen, directors, and committee men would seem to be the only cure.

The fundamental fact is that a national organisation like the E.D.A. can create more business for a given expenditure than is possible by any form of individual effort.

The E.D.A. is not only able to employ its own staff of publicity experts and to draw upon the services of men in the front rank for special work, but it has also the voluntary assistance of technical experts from every branch of the industry who give their time to committee work freely for the benefit of the industry as a whole.

In this manner much entirely new business has been

created by which manufacturers, contractors, and supply authorities in particular have profited. For instance, when it happens that a new electrical process is introduced, or even suggested, in a particular area, the proposal is investigated and information circulated in other parts of the country and particularly to the manufacturers of the apparatus and the firms likely to employ it.

When a promising field for development is discovered, an expert report is prepared containing all available information for the guidance of engineers and firms likely to be interested. In this way a great many subjects have been, and are being, dealt with, as, for instance, to mention only a few: refrigeration, electrical furnace treatment, electric welding, electrical rivet heating, domestic water heating, agricultural electrification, ultra-violet light and allied apparatus.

Arising out of the factory and workshop lighting campaign, no fewer than seven elaborately drawn up booklets and circulars were separately communicated at suitable intervals to every factory and workshop in the kingdom. The whole of this propaganda was directed to encourage the employment of more and better lighting in the interest of improved output. The direct result was highly satisfactory, but the indirect result of educating the public to an appreciation of more scientific lighting is incalculable. Contractors meet it daily in the discovery that their clients are now prepared to talk of alterations and improvements which, a few years ago, would have been considered too costly to be worth while.

It cannot be too strongly stressed that a campaign of this sort directed by an authoritative body like the E.D.A. is out of all proportion to anything obtainable at similar expense by individual effort. It profits every section of the industry, directly or indirectly, and every individual concern whether a subscriber to E.D.A. or not.

A most profitable activity of E.D.A. is the employment of highly skilled lecturers, one of whom is available wherever an audience can be found. Hundreds of public lectures are given in this way. Many sets of lantern slides and a large number of film stories, produced with the aid of the latest and most up to date devices of the film studio, are available for the use of kinema theatres, exhibitions, &c., and are generally at the disposal of members.

A small, but highly important, work is the provision of lectures for school teachers by means of which a knowledge of electrical appliances is transmitted to a great number of children who, apart from being prospective consumers in the years to come, are active little propagandists in the present.

A negative function of E.D.A., but one that is nevertheless important, consists in watching all current electrical advertising and in communicating with those advertisers who, in pushing their own goods, cast some disparagement on another section of the industry. Such communications are always received in the spirit intended and the bad propaganda is redrafted.

The national newspaper and magazine advertising of the Association is designed to cover the whole country, but as only £12,000 to £20,000 is available for this purpose, nothing sensational can be expected. When it is remembered that the increase of supply revenue created recurs annually afterwards, it will be seen how very small an increase of revenue in each district is necessary to justify the expenditure of so small an amount. There is no doubt that this expenditure is well invested and that the direct return from the advertisements to the three sections of the industry much more than covers the cost. It is equally certain that a campaign run upon three or four times this scale would be more effective in proportion.

The fact that this Press advertising emanates from a body, quite independent of any individual interest, has an advantage which more than doubles the value of the money spent. I refer to the value of the editorial notice and comment, amounting in 1929 to no less than 13,000 column inches, which no individual effort could obtain.

The E.D.A. is an organisation essentially designed for the benefit of all—therefore it should most certainly be supported by all. The majority take this view, and it is very desirable that the outstanding minority should be so informed of the position as to follow suit; then no one could be said to receive benefit that he had not helped to create.

It is significant that the industry has never prospered so mightily as since the E.D.A. has been active, and this despite the fact that other industries are suffering serious depression. The gross profits from supply have more than doubled in a period corresponding with the life of E.D.A. and though, no doubt, many causes contribute to this remarkable prosperity, the incidence of E.D.A. as a factor cannot be overlooked.

Apathy and misunderstanding are not, of course, confined to supply undertakings. I could say a good deal on the subject to manufacturers and more to wholesalers, but for the moment I will be content to address my own friends—the contractors. So far as the E.C.A. is concerned a scale subscription is made through the central office, but there are contractors outside the Association and some inside who still fail to see the immense force that E.D.A. presents for their own benefit. There is no section of the industry with so large a share of the direction and control of E.D.A. in proportion to its subscription as the electrical contractors. Immense opportunities are offered to contractors through the medium of the area committees and district circles. In some localities business of the most important kind is being arranged between the supply authority and the contractors through the medium of the E.D.A. circle. On the other hand, there are other important districts where even a special whip from E.C.A. headquarters has failed to produce an attendance of contractors at E.D.A. meetings, with the result that the whole of the business is left on the hands of the supply and wholesaler members.

Having watched the game from all sides, I advise contractors to take a lively interest in local E.D.A. activity, to help everybody concerned in every way possible, and to reap the installation work as their reward. I also advise supply engineers in any scheme of development or salesmanship not to leave the contractor out of the picture. With support and guidance he will work hard and long in the building up of load without other pay than the profit he can scrape for himself on the first cost of installation.

Converting Plant.

"Bulletin No. 9, G.E.C. Converting Plant, 1930," 3rd edition, recently issued by the General Electric Co., Ltd., would probably be more correctly described as a text book than a trade publication. While it deals, of course, largely with G.E.C. products, much in the way of general principles is discussed. The most important developments in connection with converting plant in recent years have lain in the direction of automatic operation, and the economies which may be effected by using automatic methods of control are to-day fully realised. Now that it is firmly established that completely reliable automatic operation can be guaranteed, the tendency to install automatic converting plant has become very marked. The G.E.C. has installed such plant of a total capacity of over 50,000 kW. Full particulars of the various methods of automatic control are given in the bulletin, but special attention is directed to the claim that the G.E.C. is the only company which can supply complete supervisory and automatic plant with apparatus manufactured entirely in its own factories. The bulletin is divided into two principal parts, the first dealing briefly with non-automatic converting plant, while the second describes the various methods which the G.E.C. has developed for the purposes of automatic control.

The Portobello Extensions.

A description of the new plant at the electricity works of the Edinburgh Corporation which was recently officially inaugurated.*

By DONALD SMEATON MUNRO, M.I.E.E.

EDINBURGH is an attractive city, even to engineers, and its three succeeding electrical chiefs have maintained since the beginning of the supply in 1895 an enviable progressive record. The searchlights of the technical Press were directed on the Portobello power house, fig. 1, when it was formally opened by H.M. King George in July, 1923, and on the occasion of the I.E.E. summer visit in 1928. Now again, when it is in focus owing to the completion of the extensions and to the linking up of the Scottish grid, a short outline of the station's history and a description of the installed plant are called for.

Fig. 1.—General View of Portobello Generating Station.

Designed from the outset for a.c. generation, its situation was determined in close proximity to the cold North Sea and the Lothian coalfields, unlike its direct-current predecessors, Dewar Place, Macdonald Road and Leith stations, which were built in the dense, easy distributive city area. Portobello lies some three miles to the holiday-making side of Edinburgh, on the open Firth of Forth, and the small town has a fine stretch of sand. Little attempt, however, has been made to render the sea front alluring or impressive to summer visitors. Indeed the pleasant clean lines of the super station, built to the design of Mr. MacRae, the city architect, compose by far the most impressive architectural feature of this undeveloped seaside resort. Travelling from Edinburgh by the broad road which leads to Dunbar, Newcastle and to London, one comes on the station suddenly. Its predominating deep red brick colour stands out substantially against the background of normally grey-green sea.

The coaling arrangements are discreetly concealed from public view, for the railway sidings, designed for 120 loaded trucks, lie in a hollow to the landward or right-hand side of the main road. Here also provision is being made for the new tipping plant, &c., for unloading up to 1,000 tons per day, the coal being conveyed through tunnels under the roadway by belt and bucket conveyors to the boiler-house bunkers. On the railway side of the road also we catch glimpses of the new grid sub-station, whose structure, "like the airy fabric of a dream" to our yet unaccustomed eyes, is partly veiled by the 33,000-volt sub-station for the Lothian Supply Co. and some rather mean tenement buildings.

Portobello station is built on the site of old brick-works about 30 ft. below the street level. The frontal elevation is not high, and this ensures better lighting of the turbo-generator hall, which lies behind the front office, control room and switchboard, and the new meter section. The group of boiler houses at the back is separated by a narrow pipe annexe. Owing to the slope of the ground towards the sea the wall head height of 84 ft. on the boiler houses does not obtrude on the outside aspect, and only the tops of the eight short and business-like 9-ft. diameter chimneys are visible from the front.

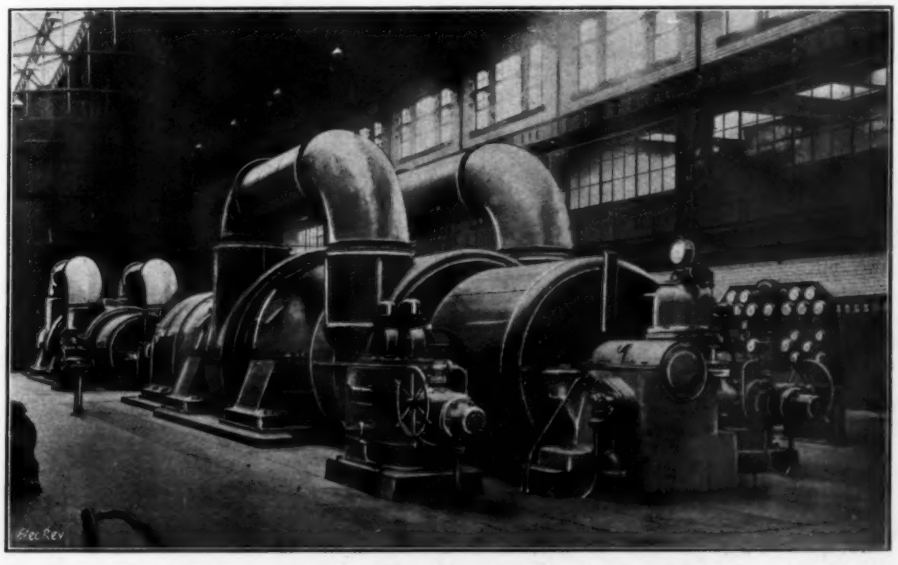


Fig. 2.—The Two 31,250-kW Turbo-alternators.

About 300 ft. behind the boilers and near to the promenade, which crowns the sands, is a pump house now extended to hold two new circulating pumps, each of 30,000

* ELEC. REV., May 9th, p. 888.

gal. per min. capacity. Rising out of the sea at a distance of 525 yards from this outbuilding are three beacon towers, which mark the ends of the sea pipe lines which run out beneath the foreshore. The total area of the land acquired by the Edinburgh Corporation for electricity development in this neighbourhood extends to 47 acres, but only one-third, approximately, of it is occupied, so far, by the power house and allied buildings. The direction of extension of the station is to the east, and, although the size and weight of the plant installed are enormously in excess of the original anticipation, there will be no insuperable engineering difficulty in making further additions, if it is not decided in the future to build an entirely new super-station somewhere else in Edinburgh's now very large and growing supply area.

Prior to the first starting up of Portobello station the Electricity Department operated 42 separate generators with a total capacity of only 31,000 kW. About the year 1913 the late Sir Alexander Kennedy, who at that time was consultant to the Edinburgh Corporation, advised the purchase of the present site and planned the first layout of the station. The foundations were laid down for two sets of 5,000 kW each, but, Edinburgh not being a favoured munitions area, the work was suspended at the request of the Ministry in 1916. Two years later permission was given to proceed again, and it is interesting to observe how the outlook had changed in a short period, for Sir Alexander reported that the units formerly decided on were too small, and so the station was redesigned to accommodate three 10,000-kW turbo-alternators, with provision for a fourth set of the same output. In 1926 the additional 10,000-kW machine, with its complement of boiler plant, was added, and a 4,000-kW set was taken from another station and laid down, so bringing the total capacity up to 44,000 kW at normal rating. The 10,000-kW generating units were all placed side by side across the long axis of the turbine house, an arrangement which had to be changed later for new machines when what is now called "the extension" was authorised.

The contemplated increase of three large units and the nature of the sand and clay subsoil necessitated much pile driving to ensure the stability of the massive turbine foundations and the superstructure. Since October, 1928, over 1,890 rectangular-section ferro-concrete piles, varying in length from 19 to 43 ft., have been driven into the ground over an area of 6,000 sq. yd. The reinforced raft on the top of piles varies in thickness from 12 to 48 in., according to the disposition of the load and the side stresses to be expected.

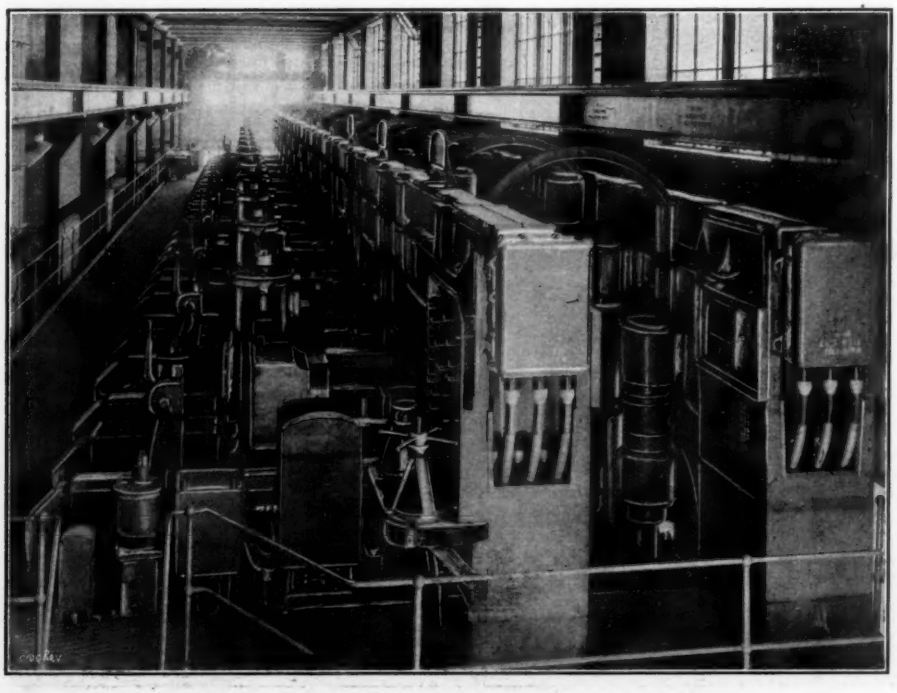


Fig. 3.—Top-end View of Main Metal-clad Switchgear.

The Extension.

In the year 1926 the Electricity Commissioners sanctioned an immediate increase of two sets, each of 31,250 kW capacity at maximum continuous rating, with the necessary boilers, switchgear, and auxiliaries. The foundations only of the first of these sets were on view at the time of the I.E.E. official visit, but both sets were in commission by the middle of last year, and now the ground has been prepared for a further similar large turbo-alternator. The extension has cost £827,849, which represents £13.2 per kW of plant installed. This figure will be reduced when the new unit is added, as the outlay to date includes some of the preparatory costs of the contemplated addition. The total cost of the Portobello undertaking is now over two millions sterling (£17.7 per kW). During the ten years since the power house was begun the electrical energy produced has risen from 25,600,000 kWh to 138,500,000 kWh. When the extension is complete the maximum continuous rating of the Portobello station will be 117,500 kW. The station, which is now linked to the grid, not only generates for the extended city area, with its lighting, power, and tramway loads, but also feeds 750 sq. miles of territory at 33,000 volts

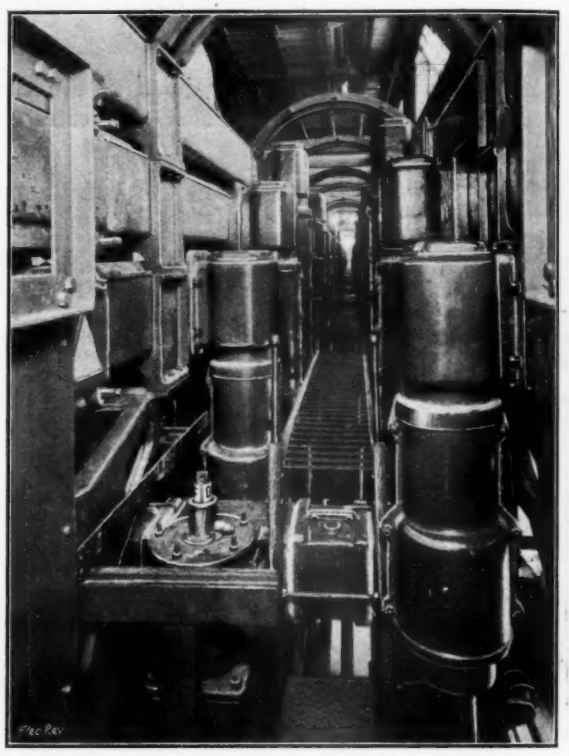


Fig. 4.—Looking between the Main Bus-bars.

through the Lothians Electric Power Co.'s system.

Mr. Edwin Seddon, M.I.E.E., M.I.Mech.E., who joined the electrical department of Edinburgh nearly 18 years ago, has been chief engineer and manager to the Corporation of the Scottish capital since December, 1924. He is also president of the Royal Scottish Society of Arts, and chairman elect of the Scottish Centre of the Institution of Electrical Engineers. All the heavy engineering and involved electrical work in connection with the extension of Portobello has been planned and carried out successfully under his close personal direction. In the execution of this very considerable undertaking, in addition to the multitudinous duties of his office, he has been ably supported by his highly efficient staff, as he is always the first to acknowledge.

Fig. 5.—Bus-bar Reactors.

The Turbo-alternators.

The appearance of the two 31,250-kW (maximum continuous rating) turbo-alternators placed lengthwise in the extended turbine hall is most impressive, fig. 2. They sit on reinforced monoliths, 22 ft. above the basement level, and their arched l.p. cylinder steam pipes suggest super-elephantine power. The turbines, which run at a speed of 1,500 r.p.m., are of the three-cylinder type, with double exhaust and two separate condensers per set. Each turbine is equipped with two steam chests, to which steam is supplied through two 12-in. diameter pipes, supported on the turbine-room steelwork, and they are coupled to the h.p. cylinder through four U-shaped pipes. Any distortion due to expansion of the 12-in. pipes is therefore confined to the steam chests and U-pipes. The steam passes in opposite directions through the h.p. and i.p. cylinders, thus balancing the axial thrust, while the l.p. cylinder is also balanced, due to the central inlet and double exhaust. Each surface condenser has a cooling surface of 16,140 sq. ft. The steam space in the two condensers is connected by means of a balance pipe, and air extraction is effected by three-stage steam jet ejectors, which are provided in duplicate. The condensate extraction pumps are also in duplicate, the respective drives being by an electric motor and an auxiliary steam turbine. The condensate discharged from these pumps passes through surface heaters on the air pumps, then through a bleeder heater at the outlet of the i.p. cylinder, and thence to the de-aerating plant. Each condenser being of the two-pass type, the inlet and outlet circulating-water connections are at the same end. These connections are completed through valves and expansion joints to the circulating-water bus pipes situated in the pipe annexe. A salinometer is provided with each set to indicate condenser leakage.

The winding of each alternator is three-phase star connected, the normal terminal voltage being 6,600 volts between phases, with the neutral point connected to earth through a remote electrically controlled oil switch and a 4.5-ohm limiting resistance. Ventilation is on the closed-circuit system, a fan being provided on each end of the rotor. The tubular air coolers are supplied with sea water from the circulating system. A directly-coupled overhung exciter provides the excitation. The stator windings are equipped with Merz-Price circulating-current protection. A field suppression switch is also provided, which, on the operation of the Merz-Price relay, automatically cuts off the excitation from the machine and short-circuits the rotor winding through a resistance of low ohmic value.

The New Switchgear.

The main switchgear is of the metal-clad compound-filled type, with duplicate busbars, figs. 3 and 4. Complete phase separation has been maintained by assembling each phase busbar in a separate metal enclosing trunk and by providing independent tanks on each phase of the main oil circuit breaker, the busbar selectors and cable isolating switches. There are, therefore, twelve tanks per three-phase unit, requiring 980 gallons of oil in all. The main oil circuit-breaker tanks are cylindrical in section, and are constructed of welded steel plate, $\frac{3}{4}$ in. thick, and secured by means of eight 2-in. diameter bolts. The rupturing capacity of each circuit breaker is 1,500,000 kVA. The main circuit breakers, selectors and isolators are solenoid operated. A feature of the gear is the very complete system of interlocking, which not only prevents incorrect sequence of the operations, but also ensures that no tank can be removed until the copper work about to be exposed has been made dead, and further, when a tank is lowered, it is impossible to make that particular switch alive. The main generator switches are designed to carry 3,500 A continuously, and the weight of each three-phase unit, complete with oil, is 31 tons.

It is intended that in future the Edinburgh system shall be divided into two sections, each supplied from one set of busbars. In order, therefore, to provide an effective coupling between the two sets of busbars and at the same time to localise the effect of a disturbance on either section, a set of 2,000-A reactors, fig. 5, has been installed as busbar couplers. Switching arrangements

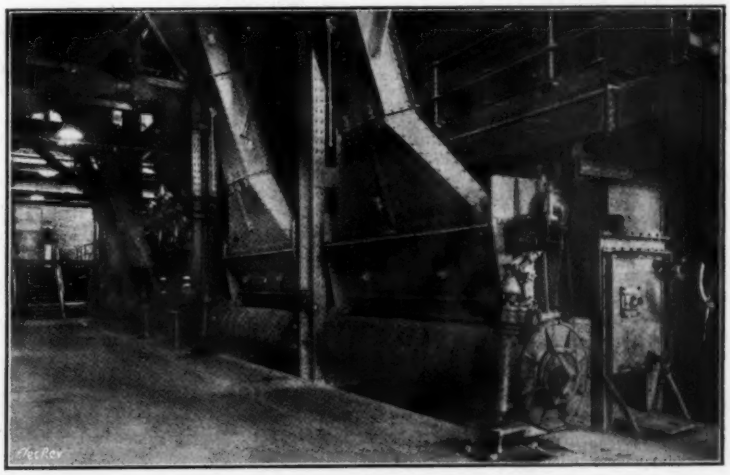


Fig. 6.—Two 80,000-lb. Tri-drum Boilers.

have been provided whereby the reactors may be isolated or short-circuited when desired. The auxiliary switchgear in the extension is also of the metal-clad type. The switches controlling the main circuits are manually operated, and they are arranged for automatic tripping on the functioning of the overload protective devices. All the sub-circuits are controlled by means of metal-clad switch and fuse units.

The Boiler Houses.

Boiler houses I and II contain eight boilers, each with an evaporative capacity of 80,000 lb. of water per hour, which feed the first section of the station which is equipped with four 12,500-kW and one 5,000-kW turbo-alternators. Boiler houses III and IV each contains four Stirling boilers. The weight of each boiler unit when operating is 323 tons. The evaporative capacity of the boilers in No. III house, fig. 6, is 80,000 lb. per hour, whilst that of No. IV is 90,000 lb. per hour, so that the total capacity of the steam plant in the station is 1,320,000 lb. per hour. The boilers are all of the tri-drum type, with an economiser immediately behind each. The combined heating surface of each boiler and its economiser is 16,850 sq. ft., and the steam conditions are 300 lb. per sq. in. gauge and 700 deg. F. total temperature.

The saturated steam from the boiler passes through a drier mounted on the front water drum, and finally goes through a superheater of 1,780 sq. ft. Householders in Portobello and bathers on the sands are protected from the products of combustion by means of Davidson grit arrestors, which are fitted in the flues and very effectively prevent the emission of fine ash. Some of the boilers are provided with Babcock & Wilcox 1928 drop-link stokers, and others with L-type stokers made by the Underfeed Stoker Co.

All the boilers are adapted for continuous firing. The flue dust is removed from the tubes during operation by steam jets, and the dust is directed to hoppers provided with vacuum extractors which convey the dust to storage tanks clear of the building; the dust finally is conveyed to dumps by motor lorries. De-aerating plant is provided to deal with the boiler feed water. A very comprehensive set of recording instruments conveniently placed includes in each boiler house a total-load-on-station indicator.

The Sea Tunnels.

The three existing pipe lines for the condenser circulation water, which run out to sea, referred to earlier in this article, have gratings at their outer ends, and the beacon towers have winches at the tops of vertical shafts. The winches perform the triple purpose of lifting the gratings, grabbing silted sand from the pocket formed to collect the sand, and occasionally to place sealing caps over the mouths of the pipes for inspection and repair purposes. Screening chambers are fitted in connection with the vertical shafts at the pump-house end of the sea pipes.

It has been the practice to employ two of the pipe lines for intake and the third for discharge, and to use each in alternate order for direction of flow. Thus material, vegetable, animal, or mineral, which happens to be lying on the screens or grids is swept back into the ocean.

This coast of the Firth of Forth is a great breeding ground for mussels, and the rapid accumulations of clustering growth in the interiors of the sea pipes at first caused much anxiety, but Dr. Ritchie, of Edinburgh Museum, investigated the problem and solved it very effectively. Now the circulating water is heated up to 90 deg. F. for a day and a night twice a month during the spawning season. This is done at the expense of running the station at a low vacuum, say 25 in., for the short periods referred to, while the hot discharge water is repassed into the inlet pipes to bring their contents to the required degree of heat.

A new discharge sea tunnel 72 ft. deep at the shore end forms part of the plan of extension, and this work is being carried out under considerable difficulties which are being successfully overcome. It lies eastward of the present three pipe lines, and 350 yards has at present been driven, leaving 150 yd. still to complete; there has been much stormy weather during recent months and hard rock has been encountered. To add to the difficulties the shallow draft boat which was specially equipped with cranes, grabs, and pumps became a total wreck while conveying sea shaft weights to Leith one foggy night. The sea shaft for the new tunnel has now been sunk to about 2 ft. below the tunnel roof, and it will be completed by under pinning, that is to say, the men will work inside the cylinder excavating and fitting the plates as they go down. The new tunnel connects at the shore end with a vertical shaft 8 ft. 6 in. in diameter. The shaft receives the discharge circulating water through two 74-in. cast-iron culverts, which are buried in the raft beneath the pipe annexe. The total capacity of pumping plant in the station is 116,000 gal. per minute.

List of Principal Contractors.

Buildings, &c., John Angus & Sons; Reinforced-concrete work, Stuart's Granolithic Co., Ltd.; Structural steelwork, Redpath Brown & Co., Ltd.; Circulating-water pumping plant, W. H. Allen, Sons & Co., Ltd.; Coaling plant, Babcock and Wilcox, Ltd., and Ritchie-Atlas Engineering Co.; Electric capstans, James A. Liddle; Boilerhouse coal bunkers, Caledon Shipbuilding and Engineering Co.; Boilers and economisers, Stirling Boiler Co., Ltd.; Chain-grate stokers, Babcock and Wilcox, Ltd., and Underfeed Stoker Co., Ltd.; Air heaters, Carrier Engineering Co., Ltd., Babcock & Wilcox, Ltd., and Underfeed Stoker Co., Ltd.; Grit arrestors and fans, Davidson & Co., Ltd.; Flue-dust extraction plant, Pneumatic Conveyance & Extraction (1929), Ltd.; Ash telphers, General Electric Co., Ltd.; Boiler-feed pumps, Mather & Platt, Ltd., and Harland Engineering Co., Ltd.; De-aerating plant, W. H. Allen, Sons & Co., Ltd., and Mirrlees-Watson Co., Ltd.; Turbo-alternators, British Brown-Boveri, Ltd.; Condensers and air pumps, W. H. Allen, Sons & Co., Ltd.; Main and auxiliary switchgear, Metropolitan-Vickers Electrical Co., Ltd.; Auxiliary motors, Bruce Peebles & Co., Ltd., English Electric Co., Ltd., and British Thomson-Houston Co., Ltd.

High-temperature Superheated Steam.

The trend during the past year or two in power-station practice to use superheated-steam temperatures in the neighbourhood of 750-850 deg. F. is supported by the extensions that are to be carried out at the Millfields Road station of the Hackney Metropolitan Borough Council. These will include one turbo-generator and three boilers, the main contractors for the boiler plant being Messrs. Simon-Carves, Ltd., while plans have also been made for this additional equipment to be doubled in the future. The boilers, of the semi-vertical tri-drum type, are each to have a normal evaporation of 125,000 lb. per hour and 150,000 lb. maximum, operating at 400 lb. per sq. in. pressure and 800 deg. F. superheated-steam temperature. They will be fired by Underfeed "Type L" stokers. The superheaters are to be of the "M.L.S." single-pass multiple-loop intertube type, designed and constructed by the Superheater Co., Ltd. Other notable high-temperature boiler installations operating or under construction in Great Britain with this type of superheater are: Walsall Corporation and West Midland Joint Electricity Authority, 760 deg. F.; Hull Corporation, 775 deg. F.; Leicester Corporation, 760 deg. F.; Leeds Corporation and Kirkstall Station, 750 deg. F.; Sheffield Corporation, 800 deg. F.; Neasden and Metropolitan Railway, 750 deg. F.; Barking, County of London Electricity Supply Co., Ltd., 765 deg. F.; Scarborough Corporation, 750 deg. F.; Leicester, 760 deg. F.; and Synthetic Ammonia and Nitrates, Ltd., 840 deg. F. One of the essential features of the "M.L.S." design is the employment of the single-pass principle, in which a series of long multiple loop elements are connected in parallel between saturated- and superheated-steam headers, giving, it is claimed, perfect steam distribution at all ratings with consequent freedom from local overheating, uniform distribution of work across the boiler, and constant final steam temperature. In order to avoid multi-pass construction, with its attendant disadvantages, the elements are made from the necessary number of tube lengths united by integral forged return bends, actually stronger than the tube itself. It is claimed that the results thus obtained are superior to any system of oxy-acetylene or electric welding, in which cases the results depend on the personal skill of the operator, and a smooth uniform internal tube surface at the weld cannot always be ensured. Another point is the great flexibility in construction, so that the superheater is easily adaptable to varying conditions of space, operating pressures and temperatures, and methods of firing. Because of the above principles of correct design and care in the selection of materials, the use of low-carbon steel can be used up to 850 deg. F., or slightly over, and 800 deg. F. is now beginning to be common practice in British power stations; this temperature is being proposed for two of the latest stations, Clarence Dock, Liverpool, and Ironbridge, in Shropshire.

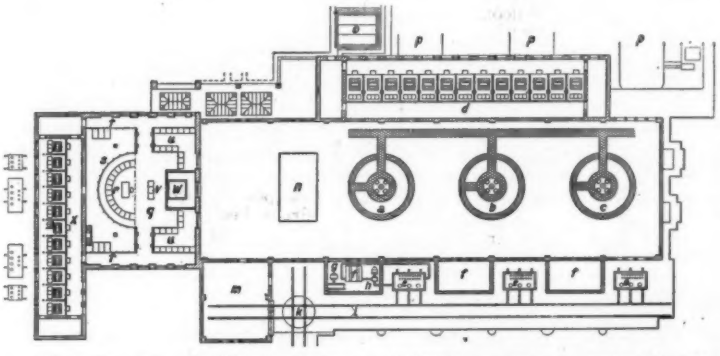
Shannon Hydro-electric Scheme.

A descriptive account of the layout and equipment of the initial portion of the Ardnacrusha power plant built by German contractors for the Irish Free State water-power development project.

By CHAS. J. WEBB, A.I.A.E.

(*Continued from page* 859.)

THE accompanying line drawings show the lay-out plan of the station (fig. 9) and the main plant connections (fig. 10). Each of the three generators is coupled to a 440-V exciter mounted on top of the machine. The weight of each generator and its exciter is approximately 370 tons, of which the rotor is responsible for 195 tons. The rotating weight of a coupled turbine and generator is 227 tons. The lower supporting spider carries in addition to the bottom guide bearing also the generator brake, which comprises four separate sections operated by oil pressure by means of which the rotor can be brought to a stop from its normal speed in about three minutes.



a, *b*, *c*, Generators; *d*, 10.5-kV switchgear; *e*, 10.5/110-kV transformers; *f*, forced-draught coolers; *g*, fans; *h*, oil circulation pump; *i*, rail track; *k*, turntable; *l*, tail race; *m*, oil shop; *n*, subway entrance; *o*, water resistance; *p*, turbine inlet pipes; *q*, control room; *r*, switch desks; *s*, main switchboard; *t*, relay boards; *u*, station service switchboard; *v*, signal receiver desks; *w*, lift; *x*, 38.5-kV switchgear.

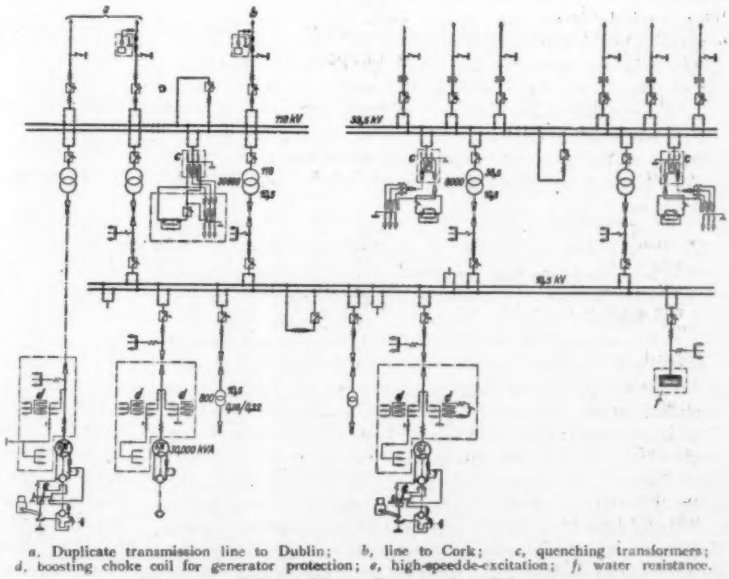
Fig. 9.—Lay-out Plan of Power Station.

The weight of the turbo-generators is supported on a system of ferro-concrete beams nearly 8 ft. thick arranged round the inlet spirals, whence it is transmitted through the concrete foundations to the solid rock.

Power House Auxiliaries.

Steel girders filled in with stone support the track of two three-motor cranes, each of 100 tons capacity, which can be coupled together by lifting beams. The generator rotors had to be sub-divided into several sections to enable them to be transported by rail. They were fitted together and mounted on their shafts in pits in the machine room, which necessitated the building being of ample breadth to allow the complete rotors to travel the length of the room without colliding with other machinery, while the cranes had to be of sufficient capacity to deal with the 195 tons which each rotor weighs. The machine room has a height of 58½ ft. and a width of 60½ ft. and, if necessary, the whole of the rotating parts of a generating set (of a dead weight of 227 tons) can be lifted by the combined cranes. The spacing of the turbines at approximately 49 ft. 4 in. was determined by the spirals. The whole of the vital services are connected to an alarm indicator, which gives the attendant in the main hall a visible or acoustic signal in the event of the failure of any one of them.

Each generator is provided with two oil tanks, the oil being raised by an electrically-driven pump from the lower to the upper one, whence it flows by gravity through separate feed pipes to the upper and lower bearings and back into the lower tank, thus forming a continuous circuit. The upper tanks are so dimensioned that in the event of the failure of the pumps the bearings will have a sufficient supply to last for three hours. The tanks of the three machines are, in addition, interconnected, and flow indicators are mounted in the vicinity of the generator switchboard panels and are provided with electrical contacts which, in the event of interruption of the oil circulation, cause a horn to sound and one of a system of alarm signal lamps on the switchboard to light.



a, Duplicate transmission line to Dublin; *b*, line to Cork; *c*, quenching transformers; *d*, boosting choke coil for generator protection; *e*, high-speed de-excitation; *f*, water resistance.

Fig. 10.—Main Plant Connection Diagram.

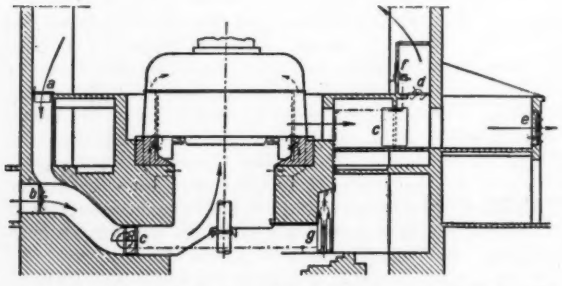
The temperature of the generator bearings is controlled by mercury spring thermometers, built into them, they being direct reading and connected to signal

lamps. The bearings are also fitted with remote-reading resistance thermometers and others are built into the periphery of the stators between the slots at four points, being likewise connected to the central temperature panel in the switch room.

For the bearings of each of the three 30,000-kVA sets 3,520 lb. of oil is required to be kept in constant circulation, whilst each of the 30,000-kVA, 110-kV transformers holds approximately 50,000 lb. of oil. Altogether approximately 497,200 lb. of oil is in continual service in the station, 270,000 lb. being associated with the transformers and 167,000 lb. with the circuit breakers. For testing and preserving it, special plant has been provided.

All the transformers in the station are mounted on wheels, so that they can be wheeled to the oil shop; since it will serve as the repair department for all the transformers distributed over the whole of the Free State, a connection with the main railway has been provided. The oil switches are also transported to this shop over special tracks.

The power for the station auxiliaries is derived mainly from two transformers, each rated at 800 kVA, connected on the primary side to the 10.5-kV bus-bars. For the more important services, the 380-volt 3-phase distribution bus-bars are to be duplicated, whilst the less important services and electric heating will be connected to a single bus-bar system; a third bus-bar system,



a, Air circulation shutter; *b*, air inlet shutter; *c*, fire protection door; *d*, heating shutter; *e*, air exit shutter; *f*, extinguisher operating handle; *g*, CO_2 battery.

Fig. 11.—Generator CO_2 Fire Protection Equipment.

fed either from a station service generator or from the station bus-bars, supplies lighting, the charging convertor for the main battery, and the second convertor for the alarm and telephone circuits. The switchgear for the whole of the station services is mounted on four boards, comprising 21 a.c. panels and seven d.c. panels, situated in the main switch-room and so arranged that in the event of a failure only a portion of the services will be involved.

In addition to the central control-rooms, the centre portion of the power station comprises various offices, stores, battery and convertor rooms, and a repair shop.

Generator Supervision and Protection.

For the control of its load, voltage, frequency, and excitation, each of the 30,000-kVA generators is provided with the usual indicating and recording meters. For protection against damage in the event of breakdown, the generators are provided with the equipment customarily supplied by the Siemens-Schuckert Co. for tripping a machine after the lapse of half a second on the occurrence of any of the following faults: (*i*) short circuit between the windings of a phase within the generator; (*ii*) two- or three-pole short circuit between the generator phases; (*iii*) an earth within the generator; (*iv*) excess voltage and current according to circumstances in from 6 to 8 seconds. These tripping devices operate in conjunction with a quick-acting de-exciter consisting of oscillating resistances in the exciter circuit. As each generator is equipped with a separately-excited exciter, de-excitation is initiated by the preliminary automatic change-over of the excitation of the exciters from separate to self-excitation.

For subjecting the protective devices described to periodical reliability trials, control devices have been provided by the aid of which mimic generator defects can be reproduced to enable the operation of the relays to be tested. Before such tests are carried out, the depression of a push button prevents the main oil switches and the de-excitation switch from operating. The whole of the protective relays, together with their controls, are mounted on special panels in the control room. Indicators enable the attendant to recognise the nature of any fault that may occur and his attention is attracted in addition by acoustic alarm signals.

Fire Protection.

The internal short-circuit protection devices are coupled to Siebenmann fire-extinguisher equipment, which works on the carbon-dioxide principle and is automatically set in action by relays. In addition, the extinguishers can be operated by hand from the generator switchboard. Each generator is provided with a battery of ten steel flasks containing together about 660 lb. of carbonic-acid gas, corresponding to about 4,800 cu. ft. of CO_2, which is injected into the cooling-air intake duct (fig. 11). The battery is connected in such a manner that eight flasks discharge simultaneously, whilst the remaining two are emptied gradually after a time lag in order to compensate for the gas lost by unavoidable leakage through the fire doors and replaced by fresh air drawn in by the generator whilst running down. The highest attainable mixture is 40 per cent. within the 7,100 cu. ft. bounded by the air duct and the generator. The extinguishing action of the mixture takes effect at all points within four seconds of the commencement of operation and the cooling action attains a value of approximately 25,000 calories. The de-excitation switch and the fire doors are mechanically interlocked to prevent the excitation being switched on whilst the doors are closed.

The generators' exhaust air can be utilised, if desired, to heat the machine room. At the option of the engineer, the position of the shutters in the ducts can be so arranged that their cooling air is either expelled into the open or caused to circulate within the building, the inlet and outlet doors being automatically governed. Filters are not used, as the air in the neighbourhood of the station is free from dust.

For signalling between the control and machine rooms lamp tableaux are provided and so connected that, from whichever end the signal is given the tableaux remain alight until the signal is confirmed from the other end by depressing a key. The reception of a signal in the machine room is accompanied by a short blast on a horn, whilst in the control room a trembler bell is employed.

Power Transmission.

Apart from the station services, three voltages are in use in connection with the Shannon scheme. The three-phase alternators generate at 10.5 kV, the transmission lines to the main feeder points at Dublin and Cork are operated at 110 kV, whilst the medium-voltage distribution system is at 38.5 kV. In the first stage (fig. 10) two generators feed the 10-kV bus-bars, from which the 110-kV network is supplied by overhead lines across two 30,000-kVA transformers, and the 38-kV network across two 8,000-kVA transformers. The third alternator feeds through a 30,000-kVA transformer direct the 110-kV bus-bars, corresponding to the arrangement planned for the final stage of the development. The station services are fed by two transformers of 800 kVA each, connected to the 10-kW bus-bars. Five overhead lines (two ring mains and one radial feeder) emanate from the 38-kV bus-bars and three (one double and one single feeder) from the 110-kV bars. The whole of the overhead lines are protected against earth faults by quenching transformers and against short circuits by impedance protection. In the final stage of development three further alternators of 30,000 kVA each will be connected to the 110-kV bus-bars, whilst No. 3 generator of the present installation will then be connected together with the other two to the 10-kV bars. The final development stage also provides for two further 110-kV lines.

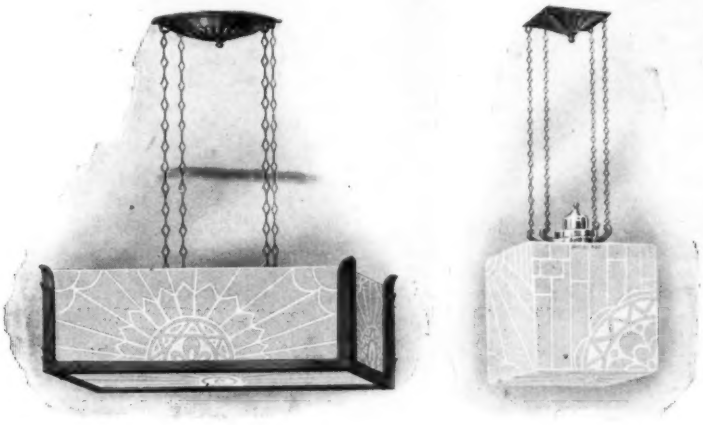
(To be continued.)

Electricity for the Home.

Brief Particulars of Recently Introduced Manufacturers' Products.

New Lighting Fittings.

We understand that Lighting Research, Ltd., Nell Gwynn House, 70, Dean Street, W.1, has been formed to market two new British lighting glasses, "Firmlite" and "Anglelite," which are both registered under the trade-mark name of "Firmiglaes." "Firmlite" can be [illegible] two-ply, three-ply, and four-ply material, and the corrective oxides, claimed to be of exceptional brilliance, are so added to the various batches as to be kept in permanent colloidal suspension, thus opening the pores of the glass and giving very high overall efficiency. Quite a new feature in this type of corrective lighting glass is the four-ply fancy unit, which has layers of colours, one over the other, giving the impression of the inside of an oyster shell. "Firmiglaes" has very little cobalt in it, and it is not blue in colour. "Anglelite," which is stocked in white, pink and gold, is made in prismatic formation. Both of these glasses can be supplied either flat or bent to any practicable shape for the new forms of invisible artificial lighting effects. In the conventional-shaped lighting units a good deal of time has been spent by the inventor in the study of illumination surfaces, and the shapes have been arrived at after very careful examination of the whole areas of the glass to see that the light penetration is even and regular throughout, and this effect is also accentuated in the even colour of the light on the spectrum. In other words, care has been taken in the use of the additional and new oxides in the glass to see that the blue end of the spectrum gets attention, as well as the red end. The light is thus very evenly diffused, and only the softest shadows are thrown at considerable distances. Figs. 5 and 6 show examples of "Firmiglaes" fittings.



Figs. 1 and 2.—"Hailwood & Ackroyd" Lighting Appliances.

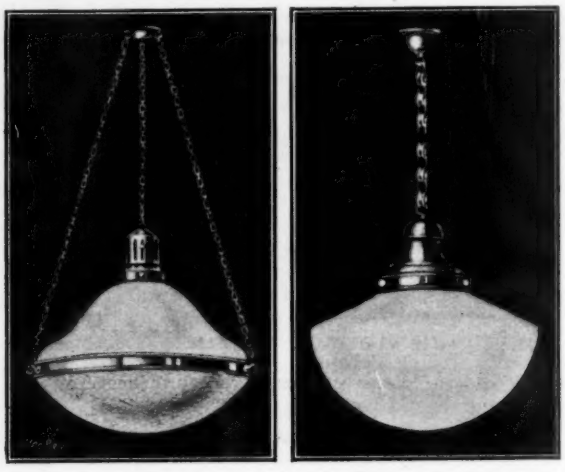
Figs. 3 and 4 depict fittings recently introduced by Messrs. Best & Lloyd, 40, Great Marlborough Street, W. In the lantern shown in fig. 3 the metal work is brass, finished in polished silver. The obscured rimpled-glass panels can be supplied plain or "firelight" tinted. The panels slide into slotted lugs and are readily removable for cleaning. Fig. 4 is a pillar-type fitting, the metal-work of which is brass with Georgian or pewter finish. The spherical portion is based on the old navigating instrument, the astrolabe, and has the signs of the zodiac in light relief round the oblique band. The fitting is designed for one light, and it is 20¼ in. high to the nosepiece. The shade is of silk.

A "bowl" fitting recently marketed by Messrs. Hailwood & Ackroyd, Ltd., Morley, near Leeds, is shown in fig. 1. This is 16 in. square and is made up of handsomely sandblasted glass panels, supported in an ornamental metal frame and suspended from a fluted circular ceiling plate 6 in. in diameter. The metal parts of this fitting are finished in

Figs. 3 and 4.—"Best & Lloyd" Lantern and Pillar Lamp.

antique brass, bronze, or oxydised metal to meet the wishes of the customer.

Another " Hailwood & Ackroyd " fitting, fig. 2, comprises a 9-in. glass cube, handsomely sand-blasted with a design in the modern style, suspended from an ornamental square ceiling plate. The metalwork can be



Figs. 5 and 6.—" Firmiglaes " E.L. Fittings.

obtained in antique brass, bronze, or oxidised metal. A smaller unit by the same company comprising a 6-in. cube is also on the market.

Electric Storage Water Heaters.

In order to meet the growing demands for electric hot-water equipment the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has recently standardised a range of storage water heaters which possess special features in robustness of construction, dependability, and economy in current consumption. The " Magnet " water heater, figs. 7 and 8, consists of a water container encased in heat-insulating material, an outer case, the electrical heating apparatus, and an automatic temperature control device. It possesses a pleasing appearance, with white-enamel finish, and is made in sizes ranging from two gallons up to thirty gallons capacity. All the working parts are mounted on one plate, which serves the dual purpose of carrying the heating elements and thermostat, and of covering a cleaning hole. By virtue of the horizontal

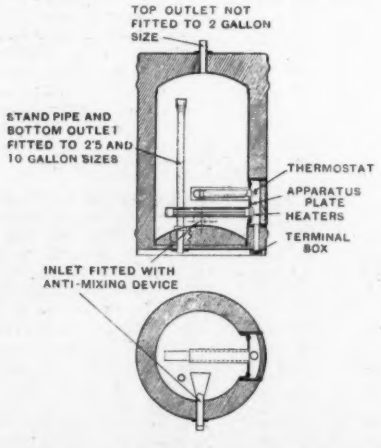

TOP OUTLET NOT FITTED TO 2 GALLON SIZE
STAND PIPE AND BOTTOM OUTLET FITTED TO 2·5 AND 10 GALLON SIZES
THERMOSTAT
APPARATUS PLATE
HEATERS
TERMINAL BOX
INLET FITTED WITH ANTI-MIXING DEVICE

Fig. 7.—Sectional Drawing of " Magnet " Water Heater.

withdrawable-type heating elements employed, the hand hole is placed at the side of the water heater, instead of in the base. This arrangement has the advantage of allowing unlimited scope in the production of a range of floor-mounting water heaters particularly suitable for installation in kitchens. The heating elements and thermostat can be removed from the apparatus plate without interfering with the water supply. The immersion heaters are so designed that they convey heat to the water at a rapid rate. The tubes containing the apparatus are welded or brazed in the plate, and all outlet pipes are also welded or brazed in the inner cylinder,

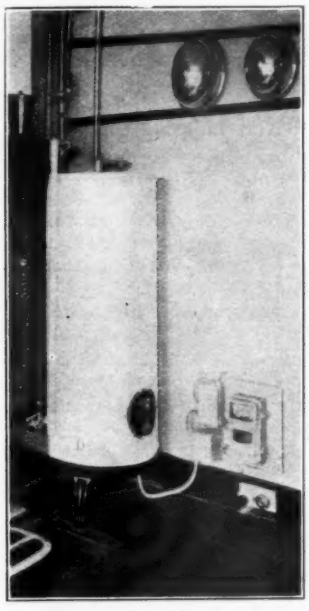


Fig. 8.—" Magnet " Water Heater in Kitchen.

so that there are no unexposed screw joints. Three inches of granulated cork lagging are used to encase the cylinder, and outcoming pipes are insulated from the outer cylinder. Thus there is no metallic connection between the inner and outer cases; furthermore, the apparatus compartment itself is packed with lagging.

The thermostat is of the bi-metal quick-make-and-break type, and is adjustable within fine limits, although for general requirements it is set to cut out at 180 deg. F.

A Combined Immersion Heater and Thermostat.

A recent introduction by INVENTUM ELECTRICAL APPLIANCES, 117, Victoria Street, S.W.1, is a combined immersion heater and control thermostat, fig. 9, made in three sizes with loadings of 1,000, 2,000, and 3,000 W. The heater consists of a heavily-tinned brass base on which is mounted a tinned-copper cylinder, designed so that the elements are not left uncovered when the tank is emptied, thus avoiding the risk of burn-outs. In the wall of the cylinder is a rectangular chamber which houses a robust and reliable "Inventum" bi-metallic thermostat. The elements are of the mica-sandwich type, each 500 watts, enclosed in tinned-copper

Fig. 9.—" Inventum " Combined Immersion Heater and Thermostat.

sheaths mounted on the base, and are easily withdrawable without emptying the tank. For use when a heater is required to operate on d.c. a suitable condenser is supplied, at a small additional cost, for connection across the thermostat terminals, housed in the base cover. The heater can be supplied without the copper cylinder if desired.

It is claimed that the thermostat will work in *any* position. For fixing the heater in the tank a cast-iron ring is required, which can be supplied if desired. The joint is made by means of a rubber gasket supplied with the heater.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

E.D.A. on the British Industries Fair.

In his interesting report on the Association's operations at the British Industries Fair in February last, Mr. A. E. Neal, the South Midland Area officer of the British Electrical Development Association, states that there was a constant and consistent stream of inquiries, many coming from the Dominions, from Canada, Vancouver, B.C., Australia, India, Germany, France, and Belgium. The telephone was in great demand by members of the E.D.A. and the electrical section. A copy of "All About E.D.A." was circulated to all electrical exhibitors, and a very large amount of literature was circulated amongst the public. The bulk of inquiries were: "Where is so and so exhibiting?" or "Where is such and such an article to be found?" It is estimated that about 2,000 inquiries were made during the Fair. The inquiry cards were not popular; in some cases they were resented, as most inquirers wanted information privately. Here are a few typical inquiries:—

From Vancouver, B.C.—Wanted the name of a British firm making "bulb lamps for sun-ray apparatus."
Belgian engineer wanted a certain type of motor.
Representative of Hall Eng. Works, Sydney, Australia, inquired *re* electric welding.
An inquiry for an electric dish washer.
An inquiry for an electric bird scarer.
Inquiry from a firm manufacturing aluminium cooking utensils for electric cookers *re* joining E.D.A.
Inquiry for flood lighting.
Procedure when supply authority changed over from d.c. to a.c.
Information *re* assisted wiring schemes.
Several inquiries *re* electric water heating.
Advice *re* an all-electric house.
A M.Sc. Leeds University *re* technical literature.
Re electrical exhibition in British Isles.
A visitor had in use for two years an electric cooker, which, when heated, produced a smell of burning rubber and spoilt the food. The name of the makers was obtained from him, he was taken to their stand, they took particulars and promised to replace it immediately.
What does E.D.A. stand for?

It is estimated that over 5,000 people visited the E.D.A. kiosk.

Cable Production in Australia.

According to the *Industrial Australian and Mining Standard* it was stated to the Tariff Board in Sydney in March last that the manufacture of insulated cables and wires would be undertaken in Australia provided adequate protection was assured. The interests concerned were seeking a duty on imports of this class. Mr. H. Daniell, a director of the Dunlop-Perdriau Co., said he represented the combined interests of the Cable Makers' Association, Metal Manufacturers, Ltd., and the Dunlop-Perdriau Co., Ltd., the capital of which amounted to over £23,000,000. For some time negotiations had been carried on, said Mr. Daniell, between the three interests with a view to the manufacture of this class of cable and wire in Australia, and with the imposition of sufficient duty a company would be formed with a capital of £250,000, of which probably £100,000 to £150,000 would be expended upon land, building, plant, and machinery, before commencing operations. When the factory was in full operation employment would be found for from 400 to 500 hands, with an annual wages bill of approximately £80,000 to £100,000, which did not include the labour engaged in the production of copper wire supplied by Metal Manufacturers, Ltd., from their existing plant at Port Kembla. Rubber compound and sheet would be manufactured and supplied by the Dunlop-Perdriau Rubber Co. in Australia. The annual requirements of the Australian trade in the sizes it was proposed to manufacture Mr. Daniell estimated at between £400,000 and £500,000. From 9 to 12 months would elapse from the time plans were prepared before the plant would be in production, and a further three to six months before the full requirements of the trade would be satisfied. An expert from England would advise the company in regard to location of the factory, necessary plans, and other matters.

Local Exhibitions.

HOVE.—The Mayoress, in declaring open an exhibition of domestic electrical appliances at Hove Corporation electricity showrooms recently, said electricity was the solver of the servant problem. It could not only illuminate the home, but could also ease the labour of washing, do the ironing, cook the food, polish the floors, and save hours of work in the modern household. Ald. A. Nye, chairman of the Electricity Committee, said the Corporation bought the undertaking 16 years ago and the capital expenditure to date was £400,000. Of that, £110,000 had been repaid and a reserve fund of nearly £70,000 created. There were 10,000 consumers on the books.

GOOLE AND SELBY.—Continuing their chain of electrical exhibitions, Electrical Distribution of Yorkshire, Ltd., held a successful exhibition in the Scouts' Hall, Goole, from April 25th to May 3rd. A similar exhibition was opened on May 9th at the Rawden Institute, Selby.

Large American Radio Amalgamation.

Referring to the amalgamation of the American General Electric Co. and the Westinghouse Electric and Manufacturing Co. with the Radio Corporation of America (ELECTRICAL REVIEW, May 2nd, p. 823), this scheme was approved at the recent annual meeting of the stockholders of the Radio Corporation. At the meeting an increase was also voted in the common stock from 7,500,000 shares to 15,000,000 and class "B" preferred stock from 813,665 shares to 1,500,000 of no par value.

Yarrow Industrial Boilers.

We have before us a list of orders that have been received by Messrs. Yarrow & Co., Ltd., of Scotstoun, Glasgow, during the last few months (many are repeat orders) for their land boilers, showing continued progress in the use of these boilers for industrial purposes. The list includes the following: H.M. Dockyard, Devonport North; two repeat orders, one for a boiler, and the other for one unit comprising boiler and superheater with economiser in series. Heera Mills, India: three units, each comprising boiler and superheater with economiser in series. Geertruidenberg power station: third repeat order for two units (the evaporation per boiler is over 150,000 lb. at 570 lb. per sq. in. working pressure, the final steam temperature being 797 deg. F.). Nijmegen power station: repeat order for two units. Other orders are from the Japanese Government; Savoy Hotel, London; the Ellangowan Paper Mills; and Messrs. J. Lyons & Co., Ltd., Cadby Hall (a second repeat order).

Sussex Contractors at Dinner.

In proposing the toast of "The Electrical Contractors' Association and Allied Associations" at the annual dinner of the Sussex branch of the E.C.A. held at Brighton last Saturday, Mr. A. J. Ryan, M.I.E.E., of Hastings, referred to the success of co-operation in the various sections of the industry in promoting that "all-electric age" which was ultimately bound to arrive. Mr. H. Willoughby-Ellis, president of the Association, in replying, applied the term of "fantastic dream" to the fears of those who seemed to think that on account of the extension of the grid under the national electrification scheme chief engineers would be able to devote their time to wiring and sales, to the detriment of the electrical contractor. In his opinion the electrical contractor stood in no danger; not 17 per cent. of the houses were properly wired. Mr. H. L. Holford, of Hove, submitted the toast of "The Engineers of the Sussex Supply Stations," and in response Mr. J. K. Brydges, of Eastbourne, said that there were six or seven municipal generating stations in Sussex and other smaller stations. He had at Eastbourne endeavoured to place as much work as possible in the hands of the local contractors and there were 1,000 electric cookers in Eastbourne alone. Electrical energy at Eastbourne was probably the cheapest in the country owing to an operation of a tariff system enabling them to supply consumers at a halfpenny per kWh. A collection was made on behalf of the Electrical Trades Benevolent Institution.

G.E.C. Sports.

The G.E.C. eleventh annual sports and gala will be held at the G.E.C. London Sports Ground, Preston Road, Wembley, on Saturday, July 5th.

German Activities in Australia.

It is reported that the Bosch Co., of Stuttgart, Germany, is in negotiation with an Australian syndicate with reference to the establishment in the Commonwealth of a branch factory for the manufacture of sparking plugs and other electrical equipment for motor vehicles.

Germany's Electrical Imports and Exports.

According to the official trade returns just to hand, the imports of electrical machinery and apparatus into Germany during the two months ending with February last attained a value of £388,550, as contrasted with £427,950 in the corresponding two months of 1929. On the other hand, the exports of similar material from Germany reached a total of £4,859,100, as compared with £4,602,900.

A Holophane Conference.

On July 7th and 8th the HOLOPHANE CO., LTD., is holding a conference of some of its foreign affiliations, at which representatives from the following countries will be present:—Finland, Denmark, Turkey, Germany, Poland, Austria, Greece, Norway, Belgium, Australia, India, Sweden, France, Jugo-Slavia, Czecho-Slovakia, Holland, Rumania, Egypt, Bulgaria, Italy, New Zealand, U.S.A., and Argentina.

Polish Electrical Machinery Imports.

The imports of electrical machinery into Poland during last year attained a value of £719,700, as compared with £675,890 in 1928. There was also an increase in the imports of electrical equipment and supplies from £2,147,650 to £2,230,000.

New Italian Companies.

Among the new concerns recently organised in Italy are the Società Tungsram Elettrica Italiana, Milan, capital 50,000 lire; La Società Azienda Elettrica Bengasina, Milan, 30,000 lire; La Società Impresa Elettrica di Civitavecchia, Civitivecchia, 100,000 lire; and La Società Impresa Luce Electrica Saino, Saino, 100,000 lire.

Italian Lamp Production.

The production of electric lamps in Italy during October last amounted to 2,034,292, bringing up the total for the first ten months of the year to 18,239,215, as compared with 12,756,382 in the corresponding period of the preceding year.

Swedish Imports and Exports of Electrical Machinery.

Considerable activity is prevailing in the overseas trade in Swedish electrical machinery, the exports of which during the three months ended March last attained a value of £735,350, as compared with £640,885 in the corresponding quarter of 1929. There has also been an increase in the imports of electrical machinery from £175,690 to £254,145.

Proposed Australian Tariff Increases.

The *Board of Trade Journal* states that H.M. Senior Trade Commissioner in Australia reports that requests for increased duties have recently been referred to the Commonwealth Tariff Board for inquiry for vulcanised india-rubber cable, vulcanised flexible wire, and electrical storage batteries.

Trade Announcements.

Sir W. G. ARMSTRONG WHITWORTH & CO. (IRONFOUNDERS), LTD., has been formed for the purpose of taking over and operating the business of ironfounders and manufacturers of refined pig iron formerly carried on by Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd. The capital of the company is £130,000, the whole of which is owned by the parent company—Armstrong Whitworth Securities Co., Ltd.

Messrs. THORPE & BOSCO, LTD., announce that they have changed the name of the company to Thorpe & Thorpe, Ltd., at 36, Broad Street, Golden Square, W.1.

The Manchester depôt of Messrs. BELLING & CO. has recently moved to new and larger premises at Clegg's Court, 47, Chapel Street, Salford (telephone number: Blackfriars 1947).

Messrs. NUTTER, SON & EDGE, LTD., wholesale electrical factors, have removed from Cromford House, Manchester, and 2, Victoria Bridge, to new premises at Clegg's Court, 47, Chapel Street, Salford. (Telephone: Blackfriars 1947.)

Owing to confusion having arisen regarding similarity of titles, we are asked by the NON-FERROUS DIE CASTING CO., LTD., of Cricklewood, to state that it is not connected with the Non-Ferrous Casting Co., of Birmingham.

Messrs. BARRIE'S ELECTRICAL AGENCIES, 2, Fitzroy Street, W.1, inform us that they have been appointed sole London agents for the Long Eaton Cable Co., Ltd.

Mr. C. W. O. ROCHS, of Imperial & International Communications, Ltd., informs us that his office is now at Electra House, Moorgate, E.C.2.

Book Notices.

"Newspaper Press List, 1930." London: Sell's Ltd. Price 1s. 6d. The 1930 edition of this list has now been published, and we would recommend all advertisement managers who wish to have details regarding column sizes and cost of space in all the most important papers in the country to make application for a copy. It gives valuable information which every advertising man requires at his finger-tips. This work has evidently entailed months of study, and is certainly compiled in a very able manner.

"The Explosives in Coal Mines Order of the 15th April, 1930."—H.M. Stationery Office. Price 11d. net.

"Webel's Technical and Scientific German-English Dictionary," by A. Webel. Pp. xii+887. London: George Routledge and Sons, Ltd. Price 36s. net.

"Science Abstracts."—The price of the April issue of this publication given in the ELECTRICAL REVIEW of May 9th should have been 3s. 6d. net.

Registered Electrical Contractors.

Applications for registration from the following have recently been accepted by the executive committee of the National Register of Electrical Installation Contractors:—J. E. Fowler, Wakefield; E. Cooper, Birmingham; F. Kempster, Bury, Lancs.; E. A. Outhwaite, Leeds; T. Prior & Sons, Leeds; G. E. Baker, Leeds; Burdette & Co., Ltd., 5, Pocock Street, Blackfriars Road, S.E.1; John Carlisle & Son, Leeds; G. O. Tipping, Smethwick, Staffs.; C. J. Bartley and Co., Ltd., 11, Queen Victoria Street, E.C.4; W. G. Goddard, Bromsgrove; R. Robson, Willington; Western Engineering Co., Liverpool; G. Hopkins & Sons (Clerkenwell), Ltd., 40/52, Holloway Road, N.7; Chapman, Lowry & Puttick, Ltd., Haslemere. Applications from three contractors were declined.

Unemployment.

There was an increase of 38,087 in the number of registered unemployed during the fortnight ended April 28th. At that date the total was 1,698,400, as compared with 1,660,313 on April 14th, and 1,163,808 on April 29th, 1929. Owing to the incidence of Easter, no figures are available in respect of April 21st, 1930.

Bankruptcy Proceedings.

HARRY GEORGE EDGHILL, electrical and wireless engineer, 13, Wembley Hill Road, Wembley, Middlesex.—The receiving order in this matter was made on the debtor's own petition recently. The statement of affairs filed showed liabilities of £637, against assets of £131, leaving a deficiency of £507. The debtor commenced business as an electrical and wireless engineer at 2a, Shrewsbury Road, Harlesden, with £10 savings, and in May, 1929, removed to 13, Wembley Hill Road, Wembley, at a rental of £110 per annum. He obtained a private loan of £150, and spent £30 in fitting up the shop, and the remainder of the money in carrying on the business, which was not successful, and he gradually got into debt. He became aware of his position in December, 1929. The debtor attributed his failure to lack of capital, bad trade, and insufficient profits to pay expenses.

S. E. RICHARDS and A. K. NEILSON (Richards & Neilson), wireless and electrical engineers, 182, Tulse Hill, S.W.2.—Receiving order made May 5th on debtors' petition. First meeting May 16th, and public examination June 17th, both at Bankruptcy Buildings, Carey Street, W.C.2.

J. BAINTON, electrician and radio engineer, 86, Wheelock Street, Middlewich.—Receiving order made May 1st on debtor's petition. First meeting, May 15th, at the Official Receiver's office, 12, Lonsdale Street, Stoke-on-Trent. Public examination, June 5th, at the Petty Sessional Court House, Edleston Road, Crewe.

R. A. READ, electrical engineer, 9, The Pavement, Middle Lane, Crouch End, N.8.—Last day for receiving proofs for dividend, May 24th. Trustee, Mr. V. Ferrars, Official Receiver, Bankruptcy Buildings, Carey Street, W.C.

N. A. WILEMAN (A. Wileman & Co.), electrical engineer and contractor, 141, Commercial Street, Maesteg, Glam.—First meeting May 16th, at 34, Park Place, Cardiff; public examination June 19th, at Court House, Wyndham Street, Bridgend.

B. L. COX, electrical engineer, 45, Shirland Street, Chesterfield.—Trustee, Mr. L. Barnes, 73, Salter Gate, Chesterfield, appointed May 6th.

H. W. BEESLEY, motor-cycle and wireless engineer, High Street, Brackley.—Trustee, Mr. G. Mallam, 37, Cornmarket Street, Oxford, Official Receiver, released April 9th.

H. A. HYDE, wireless dealer, 148, Weston Park, Crouch End.—Trustee, Mr. T. Gourlay, Official Receiver, released April 14th.

J. H. JACKSON, electrical engineer, Dock House, Winsford.—Last day for proofs for dividend, May 26th. Trustee, Mr. C. J. Pyke, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver.

J. HOBSON, electrical engineer, Cross Street, Pendleton, Salford.—First and final dividend of 1s. 11½d. in the £, payable on May 19th at the Official Receiver's office, Byrom Street, Manchester.

Company Liquidations.

BRITISH PHOTOTONE, LTD., Dorland House, Regent Street, W.—The statutory first meetings of the creditors and shareholders were held on May 9th at the Holborn Restaurant, before Mr. H. P. Naunton, Assistant Official Receiver. The winding-up order was made on the company's own petition. The chairman reported that the company was formed in June, 1928, with a nominal capital of £250,000 for the purpose of acquiring and exploiting patent rights and sychronising devices relating to the making of sound films and the synchronised reproductions of musical settings to fit all films. The issued capital was £215,000, of which £135,000 was subscribed for cash and £80,000 was allotted as fully paid to the vendors. The company acquired, *inter alia*, an invention relating to a device for synchronising a moving film with sound recording or reproducing machines, the purchase consideration being the issue of shares to the value of £23,750 and the payment of certain royalties. Several other agreements were entered into for the acquisition, *inter alia*, of a concession for five years for marketing an electrical sound reproducer and the benefit of trade facilities with 671 kinemas or with installations of panatropes with a view to the adoption of the phototone synchronising device and a sub-licence to manufacture a multiple turntable reproducing apparatus. A prospectus was issued on July 14th, 1928, inviting subscriptions for 400,000 shares of 5s. each. The lists opened on July 18th and were closed the same day, the issue being largely oversubscribed. Funds were raised on the security of debentures, but on April 4th, 1930, owing to the breakdown of negotiations for financing h.p. agreements with exhibitors of the Harris apparatus, the company was without resources, and the directors resolved that the business could not be carried on and that a petition for winding up should be presented. A receiver was then appointed on behalf of the debenture holders. The trading accounts showed a loss of £66,434. The draft accounts filed under the liquidation showed a surplus in assets of £19,191 after meeting the liability of £37,216, but the account with the contributories disclosed a deficiency of £195,809. The failure of the company was attributed to the fact that the companies were pioneers in this country of a business fraught, from a technical point of view, with exceptional difficulties; that about the time that the company was in a position to commence business, American producing companies, which supplied over 80 per cent. of the films used in this country, introduced a new and better system, which completely displaced that of the company; and that negotiations made with a German sound producing company for an apparatus which was thought to be equal to that of the American company proved abortive through no fault on the company's part. Mr. C. R. Akers, C.A., and Mr. C. E. Smedley, C.A., were respectively nominated for the post of liquidator, and the chairman announced that the appointment would be made by the Registrar in due course.

ANDIA, LTD.—The statutory meetings of the creditors and of the shareholders in the compulsory liquidation of this company were held on May 7th at the Board of Trade Offices, 33, Carey Street, W.C., Mr. H. P. Naunton, Assistant Official Receiver, presiding. The chairman said that the winding-up order was made on April 7th on a creditor's petition. The company was registered in April, 1925, to acquire from the Marquis of Andia the registered trade mark "Andia" and certain inventions and patent rights relating to sound reproduction and amplifying apparatus and to manufacture and deal in goods connected therewith. The nominal capital was £25,000, all of which had been issued for cash. The company was promoted by Carl Anton Lowenadler and Ernest Axel Martin Welin, who had acquired an option extending to April 30th, 1925, of an invention of the Marquis relating to loud-speaking apparatus for use in gramophones, wireless telephones, &c. In April, 1925, an agreement was completed between one Eller as trustee on behalf of the company to be formed and the Marquis under which the latter granted to the company a full and exclusive licence to make and deal in goods under the said patent in certain countries, the consideration being £11,500 payable in cash. On the same day it was agreed that the Marquis should be appointed technical adviser to the company and receive £1,000 and a commission on sales. Both agreements were adopted by the company in general meeting. Towards the end of 1926 there was a complete change in the personnel of the board, and from that date the minute book referred to the patents as belonging to the Marquis. In July, 1927, the company assigned to a new company called Artandia, Ltd., which was promoted by the Marquis, the licence rights of the patents and the trade mark "Andia" acquired under the agreement of April 27th, 1925, and certain British registered designs. The company was to receive 5 per cent. of the net invoice price of all articles bought by Artandia, Ltd. A clause appeared in the agreement that if the latter company should be ordered to be wound up, then the rights assigned to it should revert to the company. On February 3rd last, Artandia, Ltd., was ordered by the Court to be wound up. The Marquis, however, completed a separate agreement with Artandia, Ltd., in July, 1927, selling it all the British rights, and it would probably be necessary to take counsel's opinion regarding the true position of the ownership of the patents. Accounts prepared at April 30th, 1926, showed a loss of £3,005, and an account dated December 31st, 1926, disclosed a further loss of £133 with stock of the value of £830, the whole of which was sold to Artandia, Ltd. No further business was then transacted until the latter part of last year. The failure of the company was attributed to lack of capital and to bad management. The statement of affairs filed in the liquidation showed liabilities of £8,959, of which £8,806 are expected to rank, and net assets of £356, with a total defficiency of £33,447 with regard to the shareholders. Of the liabilities, £7,094 was stated to be owing to the Marquis. The meetings resulted in the liquidation remaining in the Official Receiver's hands.

ARTANDIA, LTD., 18, Pittshead Mews, Park Lane, W.—The report of the Official Receiver-in-charge of the compulsory liquidation of this company shows liabilities of £5,393, against assets of £3,445, and a deficiency of £25,749 as regards contributories. The company was formed as a private company in May, 1927, with a nominal capital of £26,250, to acquire patents in relation to sound producing and amplifying apparatus and to carry on business as manufacturers of loud speakers, gramophones, &c. Under an agreement the Marquis of Andia sold to the company for £15,450 in cash and 25,000 "B" shares of 1s. each certain letters patent relating to loud speakers invented by him. Very little business was done by the company; a balance sheet to December 31st, 1928, showed sales of £1,233, a gross profit of £578, but a net loss of £7,605. Debentures of £3,000 were issued, and on February 28th, 1930, the bondholder appointed as receiver Mr. J. Murray Napier, who has taken possession of the assets. Only a few pounds have been realised by him at present, as the chief assets consist of loud speaker parts and the patents. There would appear to be no prospect whatever of any funds becoming available for distribution amongst the unsecured creditors of the company. The failure of the company is attributed to dissension between the directors; to the heavy price paid by the company for the patents; and to the fact that orders for goods far in excess of requirements were given.

IDEAL WIRELESS CO., LTD., Dorland House, 14, Regent Street, S.W.—Under the compulsory liquidation of this company the report of Mr. H. P. Naunton, Official Receiver, has been issued, together with a summary of the accounts, showing liabilities of £930 against assets of £835, and a deficiency of £1,096 as regards contributories, the issued capital consisting of 1,002 preference shares of £1 each. The company was formed in May, 1929, with a nominal capital of £6,000 to carry on business as manufacturers of and dealers in wireless apparatus and gramophones. In the early part of 1929, Abraham Silver Black (a director), who is a wireless engineer and a director of the Elect Radio Co., Ltd., designed a portable wireless set, but having no capital he was unable to manufacture or put it on the market. Arrangements were made whereby the company was formed, and "Ideal" wireless sets were manufactured and distributed, but difficulties arose, and eventually a petition for a winding-up order was presented by the manufacturers. The failure of the company is attributed to lack of capital, which made it impossible for the company to carry out an advertising campaign and to pay for the sets as they were delivered.

RICHARD WADE, SONS & CO., LTD.—Winding up voluntarily for purposes of reconstruction. Liquidator: Mr. C. C. Akers, West Hartlepool.

ELECTRODRIVES, LTD.—Winding up voluntarily. Liquidator, Mr. D. R. Evans, 29-30, King Street, London, E.C.2.

SOLAFLEX, LTD.—Winding up voluntarily. Liquidator: Mr. W. Stanley Evans, 12, Grosvenor Gardens, London, S.W.

POWER DEVELOPMENT CO., LTD.—A final distribution under this voluntary liquidation is to take place. Creditors should send the usual particulars to the liquidator, Mr. A. D. Wykes, 67, Watling Street, E.C., by May 25th.

WYNSOR ELECTRIC RANGE CO., LTD., 31, Lombard Street, London, E.C.—Winding up order made May 5th, 1930.

Dissolutions of Partnership.

POWERPLUS ELECTRIC PLANT CO., electrical engineers, 8, Paul Street, Finsbury, E.C.—Mr. F. Angell, Mr. H. B. Angell, and Mr. E. Duval have dissolved partnership. Mr. H. B. Angell and Mr. E. Duval will carry on the business and attend to debts.

ANDERSON ANGELL & CO., 8 and 8a, Paul Street, E.C.2.—Mr. F. Angell and Mr. H. B. Angell have dissolved partnership. Mr. H. B. Angell will attend to debts and carry on the business.

"CHESTERS," electrical engineers, 139, Victoria Road, New Brighton.—Mr. A. E. Chesters and Mr. T. H. Chesters have dissolved partnership. Mr. T. H. Chesters will attend to debts and carry on the business.

Deed of Assignment.

W. P. HOLT (trading as W. P. Holt & Co.), 14, Chester Street, Bradford, electrical contractor.—Particulars of claims by May 29th to the trustee, Mr. P. Hodgkinson, 48, Sunbridge Road, Bradford.

New Catalogues and Lists.

Messrs. L. WEEKES (LUTON), LTD., Langley Street, Luton.—Two catalogues, dealing, respectively, with the company's various types of fuses, fuse wire, and ironclad switchboards, and its various designs of switch fuses, &c. Fully illustrated and priced. Also two leaflets advertising "Saftee" cartridge fuses and switch fuses.

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LIVERPOOL ELECTRIC CABLE CO., LTD., Linacre Lane, Bootle, Liverpool.—Catalogue L.E.C.2, dealing with the "Lecite" wiring system which combines the new All-Bakelite accessories and "Lecite" cables. Illustrated and priced.

HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, E.15.—A booklet illustrating the number of the many types of "Hart" batteries for electric lighting installations.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—An illustrated folder outlining a scheme for the purchase by monthly instalment of the company's all-electric receiver, type 2515, and a window placard advertising this receiver. Also a leaflet advertising the Philips "Merchandiser" for displaying and demonstrating the company's lamps.

AEONIC RADIO, LTD., 90, Regent Street, W.1.—A well-produced catalogue containing illustrated particulars and prices of the company's lighting plants, switchgear, ammeters, voltmeters, cut-outs, &c.

Messrs. TURNER BROTHERS, 134, Upper Thames Street, E.C.4.—A list of iron and steel specialities for electrical and all other purposes.

Messrs. GALLIERS, 32, St. James's Street, Brighton.—A brochure dealing with surface wiring electrical installations. Some excellent illustrations of installations carried out by this system are included.

MARELLI & Co., LTD., 19 and 20, Garlick Hill, Queen Victoria Street, E.C.4.—List No. GB/1930 giving illustrations, particulars, and prices of the company's fans.

Messrs. JOHN HARPER & Co., LTD., Albion Works, Willenhall.—A card drawing attention to a special mixture of iron which the company has introduced for light castings.

Messrs. JOHN ADAMSON & Co., Hyde, Cheshire.—A single alignment nomogram for the evaporation of Adamson waste heat boilers.

SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham.—An illustrated leaflet drawing attention to the company's unit panels.

Messrs. MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Leaflet No. 1114 describing Marconi audio-frequency testing sets.

SUN ELECTRICAL CO., LTD., 118 and 120, Charing Cross Road, W.C.2.—A leaflet drawing attention to "Sunco" electric fans. Illustrated and priced.

Messrs. HOPKINSONS, LTD., Huddersfield.—List No. 2170 giving particulars, illustrations, and dimensions of "Stamstel" valves for high pressures and superheated steam.

SIEMENS ELECTRIC LAMP & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—List No. 432 containing illustrated particulars of "Xcel" electric hot water storage tanks.

For Sale.

The Air Ministry has for disposal at Halton Camp, Bucks., a quantity of electrical and mechanical material, including motors, circulating fans, conduit fittings and accessories, milk steriliser, &c. (See our advertisement pages to-day.)

Social Events.

Members of the Field Station Department of Marconi's Wireless Telegraph Co., Ltd., held their first annual reunion dinner at Romano's Restaurant, London, on April 25th. This department was started in 1907 and in 1921 formed the basis of the present Field and Air Division, and of the original members of the F.S.D., Col. J. E. Cochrane, Mr. C. E. Prince, and Mr. R. D. Bangay were present. Out of about 50 members of the department, 24 were present at the dinner, which was followed by a concert arranged by Mr. A. B. Stapleton and contributed to by Mr. E. E. Hughes, Mr. F. Munnion, Mr. E. Praill, and Mr. G. E. Daggett. It was unanimously resolved to form a Dinner Club of all ex-members of the department and to hold the dinner annually. In order to communicate with as many ex-members as possible, Mr. A. Shore, of Marconi House, Strand, W.C., would be glad to hear from any members not notified this time, owing to their present address being unknown.

The second annual dinner of the staff of the Gravesend Corporation Electricity Department was held on May 3rd under the presidency of the borough electrical engineer, Mr. C. F. McInnes. There were nearly 100 present, and the guests included Mr. G. W. Keats, borough electrical engineer at Woolwich. Various toasts were honoured, and during the proceedings presentations were made to the chiefs of the various departments by their staffs. Mr. L. H. Saynor, station superintendent, received a silver cigarette case; Mr. G. A. Tatchell, mains superintendent, a fountain pen; Miss McInnes, chief of the clerical staff, an attaché case; and Mr. Bond, consumers' engineer, a case of pipes.

The Alton Battery Sports Club football team has been successful in winning the Harvey Charity Cup and also the championship cup of the Alton and District Junior League. The team nearly succeeded in winning a third cup, and it is interesting to note that it has not been defeated on its own ground all through the season.

The Timber Market.

Our Timber Trade correspondent reports that the demand for European wood for building and joinery use is being well maintained, and the outlook is still bright. House and general construction work is extending this year, particularly houses. The lower bank rate is a great help to industry, which is slowly gaining confidence. Stocks of timber are not large, but owing to keen selling competition values are moderate, and to the benefit of the consumer. Hardwood stocks are light and firm in value, American woods excepted. Mahogany, teak, rosewood and ebony are strong in value. Besides these there are many other fine woods of British Empire production for wireless cabinet-making purposes, and we suggest Australian silky oak and Indian laurel. They should sell well, for it is only natural for the British buyer, providing the price is right, to prefer a British production. There are good stocks of plywood on the U.K. market at attractive rates, all things considered, and although the call is disappointing now and again the demand increases year by year.

Recent Contracts.

We are informed that Messrs. F. REID, FERENS & Co. have received contracts for the whole of the poles and overhead network for the street lighting of Kirk Merrington for the Merrington Parish Council, and also for Great Ayton Parish Council. They are completing at the present time the whole of the network for the street lighting for the Frosterly Parish Council, the overhead network for the street lighting at Wolsingham, and the whole of the street lighting for Stanhope and Birtley Parish Council, these all being installations in North-East England. They also have in hand the re-conditioning of the network in the Gretna area to meet the requirements of the Electricity Commissioners for the Dumfriesshire County Council.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price May 13th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... . per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5¼d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3⅞d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£138	£11 dec.
	Grade II ... ... ,, ,,	£98	£8 dec.
	Grade III ... ... ,, ,,	£57	£5 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	8¼d.	¼d. dec.
c	,, Tubes (solid drawn) ... ,,	11d. to 11½d.	½d. dec.
c	,, Wire, basis ... ... ,,	9¾d.	¼d. dec.
c	Copper Tubes (solid drawn) ... ,,	1/0½	½d. dec.
g	,, Bars (best selected) ... per ton	£87	£5 dec.
g	,, Sheet ... ... ,,	£87	£5 dec.
g	,, Rod ... ... ,,	£87	£5 dec.
d	,, (Electrolytic) Bars ... ,,	£66	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£76	...
d	,, ,, H.C. Wire per lb.	9⅝	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	8d.	½d. dec.
i	Iron, Pig (Cleveland No. 3.) ... per ton.	67/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£20	15s. inc.
g	Mercury ... ... per bot.	£22 12s. 6s. to £22 15s.	2s. 6d. dec.
e	Mica (in original cases) small ... per lb.	6d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/3½d.	...
p	,, ,, drawn bars & rods ,,	1/3	2d. dec.
p	,, ,, rolled strip & sheet ,,	1/3¼	¼d. dec.
p	,, ,, wire ... ... ,,	1/3½	2½d. dec.
o	Platinum ... ... per oz.	£8 15s.	...
d	Silicium Bronze Wire ... ... per lb.	1/2	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£151 5s. to £151 15s.	£6 5s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/2	3d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their report dated May 10th, Messrs. James Forster and Co. stated that reaction early in the week had the effect of stimulating a better demand from consumers, particularly on the Continent, and producers were quick to take advantage of this to raise their quotations. Otherwise the position was unchanged from a week ago. "It now remains to be seen whether the present improved demand is going to be permanent or only temporary. If the latter, present prices cannot hold for long, but, should the buying this week augur a turn in the tide of consumption, there would be some hope of putting prices on a higher basis, as the stocks are well held and would not interfere with any prospective advance."

Lighting and Power Notes.

Aldershot.—EXTENSION OF SUPPLY AREA.—The Aldershot Gas, Water & District Lighting Co., has applied to the Electricity Commissioners for permission to alter the draft Special Order now awaiting approval so as to provide for the transfer to the company of the Godalming undertaking of the Urban Electricity Supply Co., Ltd., and also the electricity undertaking of the Godalming Corporation within a defined area.

Australia.—MELBOURNE.—We have received from Mr. W. H. Alabaster, city electrical engineer, a copy of his report together with a statement of accounts for the year ended December 31st last. The gross revenue amounted to £620,800, as compared with £565,279 in the preceding year, while working expenses increased from £327,873 to £351,400, leaving a gross profit of £269,399 (£237,406). After providing for capital and other charges there was a net surplus of £136,979, as compared with £110,627 in 1928. A contribution of £25,000 was made to the town fund. Capital expenditure during the year amounted to £169,626, the principal items being :—Land, £29,680; buildings, &c., £15,261; machinery, £21,750; switchboards and instruments, £15,297; mains, £27,757; substations, transformers, &c., £27,194; public lamps, £16,397. The total sum now spent on the undertaking stands at £2,635,071. The electrical energy sold increased from 84,012,467 to 89,634,022 kWh, and the maximum supply demanded from 33,200 to 36,500 kW. There was a net surplus of £6,049 on the city hydraulic power undertaking. The policy of improving the lighting of streets in the city was continued and a considerable number of additional lamps were erected during the year. A satisfactory agreement was entered into with the State Electricity Commission of Victoria for a bulk supply to the Council for a further period of five years as from January 1st, 1929. Sub-stations were erected in connection with the change-over from d.c. to a.c. and work in connection with the change-over of the apparatus in consumers' premises was progressing steadily.

Barrow.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to apply for sanction to a loan of £11,454 for l.p. mains extensions.

Birkenhead.—PROPOSED PURCHASE OF UNDERTAKING.—The Corporation Electricity Committee has considered a letter offering on behalf of the owners of the Hinderton electric light works, to sell their interest in those works subject to the arrangement of satisfactory terms. The Committee has decided that the chairman and electrical engineer be requested to consider the offer and report to the next meeting of the Committee.

Brazil.—ELECTRICAL DEVELOPMENT.—Steady progress continues to be made at the power stations of the Chade Co. in Buenos Aires, the output of which amounted last year to 718 million kWh, an increase of 82 million kWh over 1928. At the end of the past year, the company was supplying 294,207 consumers representing a load of 830,759 kW, an increase of 17,494 and 87,218 kW, respectively, during the twelve months. The new super power station erected on land reclaimed from the River Plata was put in operation in December, 1928, with a first turbo-generator set of 52,500-kW capacity; a second identical set was started in March, 1929, while a third set has been ordered and will be ready for work by the winter of 1931.

Bristol.—NEW DOCK CABLE.—The Corporation Docks Committee reports that, in order to meet the increasing requirements at the oil basin of the Royal Edward Dock for supplies of electricity, it is necessary to lay a new h.p. electric cable. The scheme includes the provision of the necessary h.p. switchgear, transformers, and l.p. switchgear, and it is estimated that the cost of the work will be £2,700.

Burton-on-Trent.—POWER STATION EXTENSIONS.—At a recent meeting of the Corporation Electricity Committee, the engineer stated that he had now settled with the Central Electricity Board the question of the amount of the contribution which the Board would make towards the cost of the extension of the switchgear and switchhouse at the power station necessitated by the operation of the Central England Electricity Scheme, and it was decided to obtain tenders for the supply of the necessary switchgear and the extension of the switchhouse.

LOAN SANCTIONED.—The Electricity Committee has obtained sanction to the borrowing of £4,458 in connection with the extension of the electricity mains from Hartshorn to Milton in order to give an alternative supply to Milton waterworks.

Continental.—FRANCE.—The Compagnie Parisienne de Distribution d'Electricité has adopted steam boilers working at a pressure of 640 lb. per sq. in. for its new plant at the Issy-Les-Moulineaux power station, while the Société d'Electricité de Paris is adopting boilers of a working pressure of 995 lb. per sq. in. for the new power station it is erecting at St. Denis.

Good progress is now being made on the construction of a dam and two electric power stations on the River Bromme for the Société des Forces Motrices de la Truyère, one at Brommat with a capacity of 160,000 kW and one of 80,000 kW at Sarrans, the individual sets of turbines and generators being of 40,000 kW capacity. It is expected that the Brommat plant will be ready for operation by 1932 and work is already in hand on the erection of a 220,000-V transmission line to connect it with Paris.

ITALY.—The Società Idroelettrica Veneta, of Treviso, has recently secured a concession to establish a hydro-electric station to utilise the water power of the River Meschio near Condignano. The Società Varese per Imprese Eletricca, of Como, has also secured powers to establish a 4,180-h.p. hydro-electric plant to utilise the water power of the Rivers Giona and Molinera, near Musignano.

NORWAY.—According to the annual report of the Norwegian Government Electricity Department for 1928 issued recently, the number of electric power plants in the country increased during the year from 2,023 (with a capacity of 1,579,086 kW) to 2,149 (1,686,250 kW). During the same period the length of the h.p. transmission lines in use in Norway increased from 11,992 to 12,218 miles and the l.p. distribution system from 16,884 to 17,108 miles. The majority of the power plants are small in capacity, the average working out at only 785 kW.

East Grinstead.—OFFER TO PURCHASE UNDERTAKING REJECTED.—The Urban District Council has declined an offer of the Weald Electricity Supply Co., Ltd., to purchase its electricity undertaking, as the amount offered is considered inadequate. The company offered to be responsible for the interest and sinking fund payments on the outstanding loans, amounting to about £43,000, and to pay £10,000 for the transfer.

ELECTRICITY SUPPLY AT FOREST ROW.—The Rural District Council has received a letter from the Weald Electricity Supply Co., Ltd., stating that there had been 80 applications from residents at Forest Row for supplies of electricity, and applying for the Council's consent to an application for a Special Order. It was stated that the charge for electricity would probably be 10d. per kWh for lighting. The Council has considered a proposal that a supply should be taken from the East Grinstead Urban District Council, and has decided to approach that body on the matter, to inform the Electricity Commissioners of the position, and to ask for guidance.

Fort William.—DUKE OF YORK TO VISIT LOCHABER WORKS.—It is stated that the Duke of York is to pay a visit to the Lochaber hydro-electric works on July 30th.

Hastings.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains to supply houses in Charles Road West, St. Leonards, and Guldeford Road, Rye, at a cost of £1,280.

Hove.—LOANS.—The Corporation Electricity Committee recommends that application be made for sanction to loans of £25,165 for mains and services, and £9,940 for meters.

Kettering.—OVERHEAD LINES EXTENSIONS.—The Urban District Council Electricity Committee is to extend overhead lines to Lubenham.

Leeds.—PREPAYMENT METERS.—The Corporation Electricity Committee has authorised the purchase of a further 10,000 prepayment meters.

Liverpool.—ELECTRICITY DISTRIBUTION.—The City Council has decided to ask for sanction to the borrowing of £135,000 to be expended on the distribution of electricity from the new Clarence Dock generating station to the central area of the city. Switchgear will cost £81,000, plant £40,000, buildings £10,500, and connecting up and contingencies £3,500.

CLARENCE DOCK POWER STATION EXTENSIONS.—The Clarence Dock Power Station Special Committee has obtained sanction to the extension of the Clarence Dock power station by the installation of a 50,000-kW turbo-alternator with switchgear and auxiliary plant, &c.

London.—SOUTHWARK.—The Borough Council Electricity Committee has voted estimates of £9,660 for new mains and £3,025 for renewals.

Louth.—INAUGURATION OF SUPPLY.—The supply of electricity from Grimsby was switched on by the Mayoress, Mrs. W. E. Maxey, on May 5th. During the week an electrical trades' exhibition was held in the Town Hall, and was opened by Mrs. J. P. Beckett, wife of the chairman of the Electricity Committee.

Manchester.—UNEMPLOYMENT SCHEME.—The Corporation Electricity Committee has had under consideration a report by the city electrical engineer and manager dealing with a scheme for the relief of unemployment. He states that in order to qualify for a grant under the Development Act it is a condition that work must be carried out three years in advance of requirements, and he presumes that a proposal to extend distributors into streets where no remunerative demand at present exists would comply with this condition. Such an extension is, of course, of a very speculative character, but, if assistance can be obtained under the Act, he considers that the experiment would be justifiable to the extent of an expenditure of £50,000. Two sections have been prepared, which could conveniently be developed, involving an approximate capital expenditure of £50,000 each. Before supplies of electricity could actually be given, however, further expenditure would be necessary in most cases on sub-stations, h.p. mains, and services. The Committee has approved the proposals of the engineer and is to make application to the Unemployment Grants Committee for its approval to the proposed work for grant purposes.

Manchuria.—New Power Station.—The South Manchuria Railway Co. is reported to have decided on the construction of a third electric power station with a capacity of 30,000 kW at Cheefun, in South Manchuria.

Monmouth.—Transfer of Undertaking.—The Town Council is to apply to the Minister of Transport for approval of the transfer of the Corporation electricity undertaking to the Monmouth Electricity Co., Ltd.

Northern Ireland.—Electricity Supply Scheme.—A further electricity scheme for the North of Ireland is announced. The new scheme is for the south-eastern part of the country, roughly the area south of a line drawn from Belfast to Dungannon, Co. Tyrone, east of a line between the latter town and Newry, Co. Down, with the coast as its other boundary. The scheme would take in the following places with statutory electricity undertakings: Armagh, Bangor, Holywood, Lisburn, Lurgan, Markethill, Portadown, Restrevor, Newry, and Warrenpoint—and non-statutory undertakings—Ballynahinch, Banbridge, Castlewellan, Donaghadee, Dromore, Kilkeel, Newcastle, Poyntzpass, and Tandragee—and twenty-three other towns which have no electricity supply of any kind, including Dungannon, Moy, Downpatrick, Gilford, Newtownards, Dundrum, and Bessbrook. Mr. J. M. Kennedy, consulting engineer, in his report to the Northern Government, advises that the existing undertakings in the area be closed down and a scheme of general centralised generation and main transmission created. The capital cost of the main transmission is estimated at £245,000 and the capital cost of taking over the existing undertakings at £250,000. Bearing in mind the idea of the control of the scheme being vested in a non-profit-earning authority as against a company which would work for profit, Mr. Kennedy is of opinion that such a Board could not function properly and effectively unless some compulsion is brought to bear in connection with the taking of bulk supplies, the closing of inefficient stations and a change from d.c. to a.c. distribution. The proposed line may be carried ultimately to the north-west, including Londonderry and Strabane, and other towns in that part of the north.

Bangor, Co. Down.—The electricity scheme was inaugurated on May 7th by Lord Craigavon, Premier of Northern Ireland. The supply is taken by overhead lines from the Belfast station, 12 miles distant.

Oldham.—Rateable-value Tariff Extended.—The Corporation Electricity Committee has decided that the rateable-value system of charging for the supply of electricity, in respect of private dwelling houses, be extended, so as to include the dwelling house portion of combined houses and shops. Two-thirds of the rateable value of the combined premises (with a minimum of £10) is to be taken as representing the dwelling-house portion.

Perthshire.—Overhead Lines.—The result of the inquiry by the Ministry of Transport in connection with the application by the Grampian Electricity Supply Co. for permission to place overhead lines at certain points at Callander has been issued. The Ministry declines to give its consent to the overhead lines in the Leny Feus Road, but consents to their erection in the main Leny Road and other parts.

Peterborough.—Electricity Supply Extensions.—The City Council has decided to give a supply of electricity to Farcet and to erect an overhead line at a cost of £1,324. The charges will be 8d. per kWh for lighting, and 1d. per kWh for power and domestic purposes.

Reigate.—Bulk Supply Agreement.—The Town Council has decided to take a bulk supply of electricity from the London and Home Counties Joint Electricity Authority until 1951 at a cost of £6 2s. 1d. per kW plus 0.2487d. per kWh for at least seven years, after which period the agreement will be subject to at least one year's notice on either side. From the time the bulk supply is available the Authority will repay to the Council the cost involved in running the station and managing the machinery, and the annual loan charges outstanding on the plant.

Rochdale.—Unemployment Scheme.—The Town Council has received sanction to the borrowing of £10,236 for the laying of mains as a scheme for the relief of unemployment.

Sleaford.—Retention of Undertaking Recommended.—Having considered Mr. R. Borlase Matthews' offer to purchase the undertaking, the Urban District Council Electricity Committee recommends the Council to keep the concern in its own hands, it being felt that the control of the supply of electricity in Sleaford should remain in the hands of the local authority rather than of a public company.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the East Cornwall Electricity Supply Co., Ltd., to authorise it to supply electricity within the boroughs of Bodmin and Lostwithiel, the urban district of Looe, the rural districts of Bodmin, Calstock, Camelford, Liskeard, and parts of the rural districts of St. Austell and Launceston; and by the West Cambrian Power Co., Ltd., to authorise it to supply electricity in the urban districts of Fishguard and Goodwick and parts of the rural districts of St. Dogmells and Haverfordwest.

Torquay.—Purchase of Buckfastleigh Undertaking Completed.—At a recent meeting of the Corporation Electricity Committee, the town clerk reported that the purchase of the Buckfastleigh non-statutory undertaking had now been completed and that the Corporation was now the owner of the undertaking. The engineer reported upon the steps which he proposed to take to maintain the supply from the existing works pending the completion of the arrangements for a supply from the Newton Abbot generating station.

Offer to Purchase Dartmouth Undertaking Rejected.—A letter has been received by the Corporation Electricity Committee from the Urban Electric Supply Co., Ltd., offering to sell its Dartmouth and Kingswear undertakings, subject to the approval of the Dartmouth Corporation, to the Corporation for the amount now outstanding on the capital expended accounts of the undertaking. The offer has not been entertained, and the Committee has decided that the company shall be informed that the Corporation is still willing and anxious to supply the Dartmouth undertaking in bulk in accordance with the draft agreement submitted to the company in December last.

Tunbridge Wells.—Loan Sanctioned.—The Town Council has received sanction to a loan of £13,200 for mains.

Electricity Supply at Chiddingstone Causeway.—The Council has received from the Electricity Commissioners an intimation that they have had under consideration the Council's application regarding a supply of electricity to premises at Chiddingstone Causeway, and in view of the comprehensive scheme which is in progress of being carried out by the Kent Electric Power Co. suggest that the Corporation should consider the question of giving a bulk supply to the company for the purpose of the development of the area in question. It has been decided to inform the Commissioners that the Lighting Committee is not prepared to recommend the Council to give a bulk supply to the company.

United States.—Hydro-electrical Development in South Carolina.—With the Saluda dam nearing completion and the proposal of two new developments, South Carolina's hydro-electric power ouput will be more than doubled, says *Power*. One of these new projects, the Santee-Cooper canal is already in process of construction, and will call for the building of two dams, one on the Santee River and the other on the Cooper River, which will make possible the generation of 235,000 h.p. This development is expected to be completed within the next four years. The second of these projects is on the Savannah River, and it will rank with the Saluda plant in size, amount of power generated and cost of construction. This dam will maintain a lake covering approximately 55 sq. miles on the South Carolina side of the river, in McCormick County. According to present plans, work on this plant will be started as soon as possible and will involve an expenditure of approximately $20,000,000

Walsall.—Loan.—The Corporation Electricity Committee is applying for sanction to the borrowing of £15,000 for service cables.

Weymouth.—Loan Sanctioned.—The Corporation Electricity Committee has received sanction to a loan of £10,000 for mains and services.

Mains Extensions.—The Electricity Committee is to lay mains in Southview Road and Argyle Road, at an estimated cost of £610.

Winchester.—Mains Extensions.—The City Council has decided to carry out mains extensions in the city at an estimated cost of £1,229.

Overhead Lines.—The Committee recommends that application be made to the Minister of Transport for sanction to the erection of overhead lines in King William's Way and New Road, Compton.

Withernsea.—Public Lighting.—The South-East Yorkshire Light and Power Co., Ltd., has made an offer to the Urban District Council to light the whole of the town and the esplanade by electricity, undertaking all the capital outlay for the conversion from gas lighting, and giving much greater illuminating power, at a cost estimated at less than a two-penny increase in the rates. The matter is under the consideration of the Council.

Wrexham.—Change-over Scheme.—The Town Council has applied for an unemployment grant towards the cost of changing over from d.c. to a.c. In the event of a grant being received, application is to be made for sanction to a loan of £7,770 for carrying out the work.

York.—Loan.—The Town Council has applied for sanction to a loan of £7,845 for switchgear.

Tramway and Railway Notes.

Australia.—Brisbane (Q.).—The report of the City Tramway Department (general manager, Mr. G. R. Steer) for the twelve months ended December 31st last states that the total revenue obtained from the undertaking amounted to £794,470, which compares with £810,954 in the preceding year. The working expenditure decreased from £607,711 to £584,390, leaving a gross profit of £210,080 (£203,243). After deducting loan interest (£112,872), depreciation (£62,602), amortisation (£7,000), and sinking fund, there was a net surplus of £7,606, as compared with £6,118 in 1928. The number of car miles run increased from 6,570,228 to 6,616,426, but the number of passengers carried fell from 77,703,264 to 76,117,084. The

revenue per car mile fell from 28.88d. to 28.31d. It is proposed to run a service of "one-man" cars on the Rosalie and Gregory Terrace routes.

NEW SOUTH WALES.—Mr. Stevens, the State Treasurer, has expressed approval of the Kearney High-speed Tube Co.'s proposal to finance and construct a railway from North Sydney to Newport at a cost of £4,500,000. The proposal, which is to be considered by the Cabinet, is conditional upon a sixty years' franchise.—*Reuter* (Sydney).

China.—NANKING.—It is reported that the municipal authorities are considering a scheme for the establishment of a service of railless cars in the city.

Japan.—NEW ELECTRIC RAILWAY.—The Ise Railway has received sanction to the construction of a new line from Kuwana to Iyatomi, and work is to be commenced shortly. The total cost of construction is estimated to be 5,000,000 yen.

DIESEL ENGINE LOCOMOTIVES.—The I.G.R. has completed the design of a 200-h.p. Diesel-engine locomotive, and has ordered a few for use experimentally. If the results are satisfactory, it is proposed to purchase several of these locomotives during the fiscal year 1931-32.

Leeds.—NEW TRAMCARS.—The Corporation Tramways Committee has decided to prepare specifications for 100 new tramcars to be supplied over a period of two years.

London.—EXPERIMENTAL WHEEL FOR TUBE TRAINS.—Experiments are being carried out by the London Underground Railways with a wooden wheel centre for rolling stock, which, it is claimed, will considerably reduce the running noise.

Telegraph and Telephone Notes.

Canada.—NEW RADIO STATION.—A radio-telegraph station, which will be the largest on the Pacific coast with a range of from 5,000 to 8,000 miles, and will provide direct communication with all parts of the Pacific, will be constructed this summer on Lulu Island, south of Vancouver. The Director of Radio-telegraphy for the Department of Marine and Fisheries, Ottawa, is making final arrangements for the construction of the station, which will be in operation by the early autumn.—*Reuter.*

India.—TELEPHONY.—It is reported that the telephone system in the State of Hyderabad is to be extended at a cost of about £40,000. New exchanges are to be established in Umri and Akandad, and the trunk system is to be improved by the erection of lines from Hyderabad to Bidar, from Warangal to Kaumnagar, and from Raichur to Naryawpel and Saidapur.

Radio-telephony.—ANGLO-SOUTH AMERICAN SERVICE.—Signal success attended the extension of the public wireless telephone service between London and South America on May 7th.—*Reuter* (Buenos Aires). For the present the service is being conducted *via* France and Spain (Madrid).

TRANSATLANTIC SERVICE.—The call rate from most parts of Great Britain to Canada and the U.S.A. has been reduced to £6 per three minutes. The "report charge," *i.e.*, when the called subscriber cannot be found, has also been reduced to 8s. The reduction is the second since the transatlantic service was started on January 7th, 1927.

Shetland Isles.—RADIO COMMUNICATION.—On May 8th cable communication between the Shetland Islands and the mainland was interrupted. Telegrams were sent by post from Aberdeen, or from Kirkwall. Wireless apparatus enabled communication to be restored later.

The Telephone Service.—SUGGESTED REFORM.—The alleged "public demand" for the reform of the British telephone service is not of merely recent growth. For years past Chambers of Commerce have voiced general dissatisfaction with the present system, yet no comprehensive scheme of reform has hitherto been put forward by any authoritative body. Now, however, the Telephone Development Association has issued for general circulation a booklet entitled "The Stranglehold on our Telephones." It outlines an alternative form of public control designed to increase the efficiency and national usefulness of the service. No attack is made on the Post Office, or its employees; it is the system alone that is said to be at fault. The amount of money available for the development of the service year by year depends, not on its needs, but upon arbitrary decisions of the Treasury, from which there is no appeal. The scheme suggests that the telephone service should be taken over by a new statutory Telephone Control Board, working on similar lines to the Port of London Authority, or the B.B.C.

U.S.A.—TELEPHONY IN CUBA.—The Cuban American Telephone Co. has arranged for the laying of an additional cable for telephone traffic between the United States and Cuba. It will span the mile-deep Florida Straits between Key West and Cuba through which flows the Gulf Stream. The cable will be approximately 110 nautical miles long, and will be the first deep-sea telephone cable of such a length to employ a wide range of frequencies up to about 30,000 cycles. Whereas the existing telephone cables between Key West and Havana are of the loaded type, the new one will not be loaded. It will be the longest deep-sea telephone cable to be multiplexed by telephone carrier-current methods, whereby it will provide as many telephone circuits as are included in all three of the present cables on this route. The energy of the voice currents will be amplified a billion fold at either end of the cable, combined with attenuation equalisers and electrical filters.

World Telephony.—DEVELOPMENT FIGURES.—New statistics of world-wide telephone development have been issued by the controller of the American Telephone and Telegraph Company. They show that the total number of telephones in use throughout the world on January 1st, 1929, was 32,712,284, an increase of 1,726,908 on the previous year's total. Of that number, North America possessed 20,894,323, of which 19,341,295 belonged to the United States and 1,334,534 to Canada. Europe had 9,236,685, of which Germany claimed 2,950,430; Great Britain and Northern Ireland 1,759,686; and France 965,519. Asia had 1,133,444, Africa 219,362, and Oceania 726,448, of which Australia's share was 476,700 and New Zealand's share 152,541; South America had 502,022. Thus, the United States had 59.13 per cent. of the total, Germany 9.02 per cent., and Great Britain 5.38 per cent. Although third in the list, so far as the actual number of telephones is concerned, Great Britain was eleventh in number of telephones per 100 of population, with only 3.8 per 100. Five European nations showed better proportional development, they being Denmark with 9.4 per 100, Sweden with 7.9, Norway with 6.6, Switzerland with 6.1, and Germany with 4.6. The United States (16.3), Canada (13.7), New Zealand (10.2), Australia (7.6), and Hawaii (7.2) also showed better proportional development than Great Britain.

Radio Notes.

Amateur Transmitters.—ENGLAND LEADS.—There are 1,800 amateur transmitters in England, as compared with the French total of 1,100. France is, however, making rapid headway and soon will reach the British total, if her amateurs develop at the rate shown in last year's return.

Australia.—PROPOSED NEW STATION.—Canberra, the Federal capital, has no broadcasting station. The city is still only in embryo with a population of five thousand when Parliament is in session and a few hundreds at other times. A definite proposal is now before the Government, says *World-Radio*, for the erection of a 5,000-watt station there of the same power as (3LO) Melbourne and (2FC) Sydney. The idea is to broadcast the more important Parliamentary debates, ministerial announcements, and official statements; the main programmes of entertainment of the Sydney and Melbourne stations would be relayed, and the suggestion is that the station should transmit on the ordinary wave band for Australia and New Zealand and on short waves for over-seas reception.

Battery Eliminators.—LANCASHIRE.—A conference of engineers representing the South-East Lancashire electricity undertakings which still supply direct current was recently held for the purpose of constituting a common policy with regard to the alteration to radio apparatus involved in changing over electricity distribution systems from d.c. to a.c.

CHESTER.—The Corporation Electricity Committee has resolved to defer consideration of the resolutions passed at the above-mentioned Conference until it receives from the Electricity Commissioners the terms upon which they will be prepared to give their sanction for the change-over of the local electricity distribution system.

SHIPLEY.—The Urban District Council Electricity Committee has asked its chairman and engineer to investigate and recommend the best means of meeting claims in respect of wireless and other apparatus arising from the change-over of the local electricity distribution system from d.c. to a.c.

Germany.—BROADCASTING HOURS.—It is reported that throughout the summer months the Berlin station is to broadcast daily from 6.45 to 8.15 a.m., in addition to its normal service hours.

Royalties.—POOLING SCHEME.—Hitherto the royalty payable on sets using the super-heterodyne principle has been 25s.; if "push-pull" amplification was also employed a further 10s. was charged, both in addition to the charge of 5s. a valve-holder payable to the Marconi Company. Royalties therefore have been a considerable item in the total cost of wireless sets. It is understood that the Marconi Company, the Gramophone Company, and Standard Telephones and Cables, Ltd., are endeavouring to conclude an agreement under which the royalty charge of 5s. per valve-holder will cover all patents held by these companies. In addition to the "push-pull" and super-heterodyne patents, amplifiers, anode-battery eliminators, and certain features of "all-mains" receivers will be affected by the agreement under discussion. Until comparatively recently the royalty charged was 12s. 6d. a valve-holder.

U.S.A. — RE-ALLOCATION OF WAVELENGTHS. — Insufficient geographical separation having been responsible for cross-talk between stations, the Federal Radio Commission this month modified the frequencies of 17 stations operating on 13 cleared channels and those of 9 limited-time stations, thereby increasing their average separation of 522 miles to 1,117 miles. Appeals are to be heard next month.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Atherton.—May 20th. Urban District Council. Supply and delivery of one 200-kVA single-phase, oil-cooled transformer, 2,400/240-V, 50 cycles. Specifications, &c., from Mr. B. Darby, electrical engineer, Atherton.

Australia.—Melbourne.—July 30th. Victorian Railway Commissioners. Turbo-alternators, condensing plant, and control gear. (B.X. 6355.)*

July 8th. Posts and Telegraphs Department. Telephonists' telephones. (B.X. 6352.)*

June 17th. Indicators. (B.X. 6333.)*

July 8th. Telephone generators. (B.X. 6376.)*

July 9th. City Council. Supply of totally-enclosed metal-clad switchgear. (B.X. 6401.)*

Belgium.—Antwerp.—May 22nd. Municipal Council. Supply of group air compressor electric motor and petrol engine. (A.X. 9567.)*

Dartford.—May 24th. Urban District Council. Supply of l.p. cable. (See this issue.)

Dundee.—June 12th. Electricity Department. Supply and laying of approximately 655 ft. 42-in. diameter cast-iron spigot and faucet piping. (May 9th.)

East Grinstead.—May 19th. Urban District Council. Supply, delivery, and erection of second-hand Diesel engine. (May 9th.)

May 27th. Urban District Council. Supply, delivery, and erection of 320-kVA alternator and switchgear, and a 200-kW reversible rotary, with transformers and switchgear. (May 9th.)

Eccles.—May 17th. Electricity Committee. Twelve months' supply of single-phase a.c. house service integrating watt-hour meters. Specification (deposit £1 1s.) and form of tender from the borough electrical engineer, Electricity Works, Cawdor Street, Patricroft.

Egypt.—Cairo.—August 17th. Mechanical Department, Ministry of Public Works. Supply, and erection of fifteen electric pumping stations, with pumps, motors, switchgear, &c. Specifications, &c. (deposit £10 5s.) from the chief inspecting engineer, Egyptian Government, 41, Tothill Street, S.W.1. Tenders to the director-general, Mechanical and Electrical Department, Ministry of Public Works, Cairo.

Farnworth (near Bolton).—May 31st. Electricity Department. Supply of l.p. cables. (See this issue.)

Gloucester.—City Electricity Committee. Supply of cooking apparatus for hire-purchase scheme. (See this issue.)

Harrogate.—May 26th. Cooling reservoir, &c., at Corporation electricity works. Tenders to Mr. C. E. River, borough engineer and surveyor, Municipal Offices.

Hull.—May 27th. Telephone Committee. Supply of three 50-line common battery private branch exchange switchboards. (May 9th.)

India.—May 21st. Bombay, Baroda, and Central India Railway Co., Ltd. Supply of electric overhead travelling cranes.

June 23rd. India Store Department. Supply, delivery, and erection of 11,000- and 400-V a.c. and 220-V d.c. switchgear, power and control cables, &c., for Shanan power station. (See this issue.)

Ivory Coast.—May 31st. Establishment, for the Government, of a central electric power station and a distribution system in the town of Abidjan, under a fifty years' concession. Particulars from the Agence Economique de l'Afrique Occidentale Francaise, 159, Boulevard Haussmann, Paris.

Liverpool.—June 6th. Corporation. Installation of an automatic telephone exchange. (See this issue.)

London.—Central Electricity Board.—May 19th. Construction of site works, foundation works, and buildings in the area of the South-East England Electricity Scheme (London Area). (April 25th.)

June 11th. Supply, delivery, and erection of 33-kV transformers for the South-East England Electricity Scheme, 1927. (See this issue.)

London County Council.—May 26th. Supply, laying, jointing and connecting up cables, &c., at Blackwall Tunnel in connection with the installation of new ventilating plant. (May 9th.)

Manchester.—May 24th. Waterworks Committee. Supply, delivery, and erection at Haweswater, Westmorland, of two rotary balancers, d.c. switchgear, cables, wiring, &c. Only complete tenders considered. Specification (deposit £2 2s.) and form of tender from the engineer, Waterworks Department, Town Hall, Manchester.

New Zealand.—Wellington.—June 24th. Public Works Department. Outdoor steelwork and 110-kV switchgear for the Waitaki power scheme. (B.X. 6238.)*

July 29th. Auxiliary turbines and generating sets. (B.X. 6356.)*

June 25th. Posts and Telegraph Department. Condensers. (B.X. 6308.)*

100,000 3¼-in. lead clips, 30,000 2-in. ditto, &c. (B.X. 6375.)*

July 16th. Government Railways. Four 30-cwt. overhead electric cranes for new goods sheds. (A.X. 9442.)*

Auckland.—June 10th. Harbour Board. Submarine cable. (B.X. 6354.)*

Northern Ireland.—Belfast.—June 4th. Belfast City and District Water Commissioners. Supply, delivery, and erection at the Oldpark works of electrically-operated pumping plant. Specifications, &c., from Mr. W. I. Quinn, secretary, Water Office, Belfast (returnable deposit of £1).

Ogmore and Garw.—May 30th. Electricity Department. Supply, delivery, erection and connecting up of 11,000-V overhead lines, together with interconnecting cables. (May 9th.)

Ottershaw (near Chertsey).—May 17th. Chester Rural and other Councils Joint Isolation Hospital Committee. Electric lighting installation at Isolation Hospital. (May 2nd.)

Portadown.—May 31st. Urban District Council. Supply, erection, and fixing of eight sets of electric motors and centrifugal pumps, with automatic switchgear. Specifications, &c., from Taylor & Wallin, 1, Saville Place, Newcastle-upon-Tyne (returnable deposit of £10). Tenders to Mr. H. Sewell, town clerk, Portadown.

South Africa.—Capetown.—June 4th. Electricity Department. Heavy current d.c. testing motor-generator set. (B.X. 6341.)*

June 25th. City Electricity Department. Supply of single-phase transformers. (B.X. 6378.)*

Johannesburg.—June 12th. S.A. Railways and Harbours. 2,000-V switch units and l.p. switchboards. (B.X. 6365.)*

Railway and Harbours.—June 19th. Supply and delivery of metal-clad 2,000-V switchboard for sub-station at Bloemfontein workshops. (B.X. 6402.)*

Staffordshire.—May 24th. Education Committee. Installation of electric light in the infants' Council school, Pelsall. (April 25th.)

Stoke-on-Trent.—May 20th. North-West Midlands Joint Electricity Authority. Supply of outdoor-type static transformers and outdoor 33-kV switching station. (May 2nd.)

West Hartlepool.—Corporation. Supply of 230-V, 2½- or 5-amp. d.c. slot meters. (See this issue.)

Wolverhampton.—June 4th. West Midlands Joint Electricity Authority. Supply, delivery, and erection at Ironbridge power station of works supply sub-station, 3,300-V and 400-V metal-clad switchgear. Supply, delivery, and erection at Ironbridge station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15-kW motor-generator set, battery, trickle-charger, milking booster and spare parts. (May 9th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Bradford.—Tramways Committee. Accepted :—
Supply of 12 double-deck railless cars (£27,000).—English Electric Co., Ltd.
Electricity Committee. Accepted :—
Supply, delivery, and erection of gangways and staircases in tank room, No. 3 works Valley Road power station.—Frederick Fox, Ltd.
Supply and delivery of circulating-water pipes for No. 9 turbine, Valley Road.—Sheepbridge Coal and Iron Co., Ltd.
Supply of one "Bailey" boiler meter for Valley Road power station.—Industrial Combustion Engineers, Ltd.

Carlisle.—Electricity Committee. Accepted :—
Condensate piping for new electricity works (£161).—Dilworth and Carr.
Steam vent and drains for boilers (£203).—J. Spencer, Ltd.
Cables (£316).—Macintosh Cable Co., Ltd.

Colchester.—Electricity Committee. Recommended :—
Portable centrifugal oil purifier (£90).—Alfa-Laval Co., Ltd
Cable (£13,042).—W. T. Henley's Telegraph Works Co., Ltd.

Cowdenbeath (Fifeshire).—Corporation Housing and Town Planning Committee. Accepted :—
Supply of 30 cookers for new housing scheme.—Carron Company.

Dartford.—Urban District Council. Accepted :—
Cable for the equipment of a transformer sub-station at Shepherd's Lane.—Johnson & Phillips, Ltd.
Two transformers (£375).—Brush Electrical Engineering Co., Ltd.

East Ham.—Electricity Committee. Recommended :—
H.p. and l.p. feeder cables (£4,548).—Enfield Cable Works, Ltd.

Guildford.—Guildford, Godalming and Woking Joint Hospital Board. Accepted :—
Installation of electric light at Woodbridge Hospital (£233).—Bowden & Higlett, Ltd.

Halifax.—Education Committee. Accepted :—
Electrical work at the new high school for girls (£907).—The Bury Lighting & Heating Co., Ltd.

Hastings.—Electricity Committee. Recommended :—
Ash-handling plant for Broomgrove power station (£599).—Stirling Boiler Co., Ltd.
Supply and erection of overhead lines to Ewhurst, Staplecross, and Cripps Corner.—W. T. Glover & Co., Ltd.

Liverpool.—Clarence Dock Power Station (Special) Committee. Recommended :—
Supply of ash-handling plant, travelling crane and grab (£3,180).—Robert Dempster & Sons, Ltd.
Supply of the boiler-house steam and feed pipes (£8,230).—John Spencer, Ltd.
Supply of two electrically-driven boiler feed pumps, complete with motors and control gear (£3,523).—Mather and Platt, Ltd.
Supply of one steam-driven feed pump (£805).—Mather and Platt, Ltd.

London.—LONDON COUNTY COUNCIL. Accepted :—
Ventilation system at Blackwall Tunnel. Provision of exhaust fans and motors :—

Harland & Wolff, Ltd.	£1,385
Howden-Ljungström Preheaters (Land), Ltd.	1,330
Musgrave & Co., Ltd.	1,265
JAMES KEITH & BLACKMAN CO., LTD.- (Accepted.)	1,150
British Air Conditioners, Ltd.	1,575
British Aerotechnical Co., Ltd.	2,260
Alternative tender, K.329a	2,200
Standard and Pochin Bros., Ltd.	—

Highways Committee. Accepted :—
Tramway track and conductor rails and fishplates.—Dorman, Long & Co., Ltd. (£53,897); Frodingham Iron and Steel Co., Ltd. (£7,232).
8,000 copper bonds (£547).—T. Bolton & Sons, Ltd.
100 gear wheels.—Metropolitan-Vickers Electrical Co., Ltd.
100 pinions.—Power Plant Co., Ltd.
Insulator clips.—Pease & Partners, Ltd.
Electrodes.—Quasi-Arc Co., Ltd.; Premier Electric Welding Co., Ltd.
Mild steel track shoe bars (£4,800).—Cargo Fleet Iron Co., Ltd.
Rolled steel axle bars (£542).—S. Fox & Co.
Driving wheel centres (£1,100).—John Baker & Bessemer, Ltd.
Plough collector gear with covers (£3,538).—Estler Bros., Ltd.
Stores Committee. Accepted :—
Provision of electric goods lift at Stamford Hill stores depot (£864).—Marryat & Scott, Ltd.

Manchester.—Electricity Committee. Recommended :—
Replacement work in the lighting battery, at the City station.—Tudor Accumulator Co., Ltd.
Electric cookers for six months.—Jackson Electric Stove Co., Ltd.; Revo Electric Co., Ltd.; Siemens Electric Lamp & Supplies, Ltd.; Credenda Conduits Co., Ltd.

Rotherham.—Electricity Committee. Recommended :—
Transformers for 12 months.—General Electric Co., Ltd.
Transport Committee. Accepted :—
Two miles of trolley copper wire (£99 per mile).—British Insulated Cables, Ltd.

Watford.—Electricity Committee. Recommended :—
Sub-station kiosk (£183).—Metropolitan-Vickers Electrical Co., Ltd.
Cable for 12 months.—W. T. Henley's Telegraph Works Co., Ltd.

Weymouth.—Electricity Committee. Accepted :—
200-kVA transformer (£208), and erection of transformer kiosk at Preston (£410).—Johnson & Phillips, Ltd.

Wokingham.—Town Council. Accepted :—
Electrical pumping machinery (£1,370).—Wallwin Co.

Forthcoming Events.

Institution of Electrical Engineers.—June 2nd to 7th. Dublin, &c. Summer meeting.
(Scottish Centre).—Friday, May 16th. Technical College, Dundee. Twenty-first Kelvin Lecture. "Some Recent Advances in the Electron Theory of Metals." Mr. R. H. Fowler.
(Western Centre).—May 23rd to 26th. Sedbury Park Hotel, Chepstow. Summer meeting.

Electrical Association for Women.—Friday, May 16th. Visit to Greenford factory of Messrs. J. Lyons & Co., Ltd. 10.30 a.m. Park Lane Hotel. Ball. Reception at 9 p.m.

Association of Mining Electrical Engineers (South-Wales Branch).—Saturday, May 17th. Porthcawl. Annual Conference.
(South Wales Branch).—August 14th. Visit to the Pirelli-General Cable Works, Ltd., Southampton.

Batti-Wallahs' Society.—Thursday, May 22nd. Hotel Metropole. Luncheon. 1 p.m. Sir Edward T. F. Crowe will be the chief guest.

Royal Institution.—Friday, May 23rd. Institution, 21, Albemarle Street, W.1. 9 p.m. "Some Scientific Instrument Makers of the 18th Century." Mr. R. S. Whipple.

Physical Society.—Friday, May 23rd. Imperial College of Science and Technology, South Kensington, S.W.7. 3 p.m. Discussion on "Magnetism."

Scottish Tramways and Transport Association.—May 23rd and 24th. Atholl Place Hotel Hydro, Pitlochry. Annual conference.

Incorporated Municipal Electrical Association.—May 26th to 31st. Eastbourne. Annual convention.

Tramways, Light Railways and Transport Association.—Hastings. June 11th to 13th. Annual congress.

World Power Conference.—Berlin. June 16th to 25th.

Electrical Contractors' Association.—Llandudno. June 25th to 27th. Annual convention.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices :—

"RADIALITE" extending brackets.

A household iron fitted with a terminal box in place of the usual 2-pin sockets.

The Leinster "100."

It is interesting to note that the "New Imperial" motorcycle on which Mr. E. A. Mellors won the Leinster "100" road race on May 3rd at a speed of 66 m.p.h. and, irrespective of class, made the fastest time of the day, as well as the fastest in the 250 c.c. class, was fitted with a B.T.H. magneto, which behaved perfectly under the most exacting conditions.

Notes.

Electricity Supply Metering.

In an article describing the electrical installation at the works at Southall, Middlesex, of the Associated Equipment Co., Ltd., and in our leading columns under the above heading, both in our issue of May 2nd last, we referred to the excellent arrangements between the supply company and the consumer with regard to the large-scale metering (nearly six million kWh per annum). Under the agreement between the supplier and the consumer the cost of the metering equipment is borne equally by both parties, who will also bear equally the cost of repairs to the apparatus. The fact that the consumer obtains a rebate of 15 per cent. as the result of taking the supply direct at the transmission pressure (22,000 V) is also of particular interest. The whole scheme was evolved after much consideration on the part of the Metropolitan Electric Supply Co., Ltd. In both the article and the leaderette referred to the arrangements were erroneously attributed to the North Metropolitan Electric Power Supply Co.

The Electrical Association for Women.

The summer programme of the Association includes a visit to the Wimbledon Corporation electricity works and showroom on June 4th, when Mr. A. E. McKenzie, M.I.E.E., chief engineer and manager, will give a talk on "What Wimbledon is Doing to Introduce Electricity into the Home," and a visit to the works of Messrs. Electrolux, Ltd., at Luton, when Mr. A. H. Hunter will talk on "The Manufacture of Modern Household Electrical Appliances."

On May 1st the Bradford Branch of the E.A.W. had its first outing, which took the form of a visit to the all-electric farm of Messrs. P. Hudson & Son, Carleton. The last lecture of the winter season of the same branch was delivered on April 30th, when Mr. W. W. Speight talked on "The manufacture and development of artistic lamp shades in the electrical world." This branch has now 74 members.

Electro-farming.

Members of the Electrical Engineering Society of the Borough Polytechnic Institute recently visited the all-electric farm of Mr. R. Borlase Matthews at East Grinstead. The visitors were particularly interested in the Law "Bloc" utility farm machine which has been installed on the farm during the past few weeks, and is the only one of its kind in this country. The machine was first shown at the Paris Agriculture Show on January of this year (see ELEC. REV., April 4th, 1930). Several new-type agricultural electric motors made by the General Electric Co., Ltd., were being installed in place of old second-hand motors, and among the other items which claimed interest may be mentioned hay-curing plant, an electric plough, an electrically-operated binder, and electro-culture apparatus. After tea the visitors inspected the hydro-electric equipment at Wiremill Lake, whence much of the power used on the estate is obtained.

Fatalities.

Pointed comments regarding the condition of a switchbox attached to a coalcutter were made at the inquest recently upon the bodies of George Cooper and George Samson, coal miners, who lost their lives in a mishap at the Lady Beatrice Pit, New Harrington, near Sunderland, on April 4th. Mr. J. A. B. Horsley, Electrical Inspector of Mines, in dealing with the state of the switchbox on the coalcutter which was believed to have caused the mishap, said there were two holes in the switchbox which would admit firedamp, if it was present, to the interior, and if the switch operated under those conditions there would be an explosion. The switch, he said, did not comply with Sections 127 and 132 of the General Mines Regulations. Mr. Harry J. Fisher, chief electrical engineer at the colliery, said the machine should not have been used without a flame-proof controller, and agreed that it was gross carelessness on the part of the man concerned. Mr. Arthur Atkinson, electrician at the mine, stated that the switch was tested and overhauled before it was sent down the pit. The inquiry was adjourned until May 27th.

Mr. Ingleby Oddie recently held an inquest at Lambeth on Mr. Joseph Gavin, lately employed as a labourer by Messrs. Dorman Long & Co., Ltd., in connection with the construction of the new Lambeth Bridge. He was moving a "cargo cluster electric lamp" when he cried out, collapsed, and fell dead. Another man knocked the lamp out of his hand with a shovel. Dr. Joseph Bamforth said the man's death was due to asphyxiation from the regurgitation of the stomach contents. He found no signs of the man having received an electric shock, but if he did receive one it might have led to regurgitation. Mr. G. Scott Ram, Senior Inspector of Factories, told the Coroner that he had examined the lamp used by Gavin and failed to find any leakage. If people used that type of lamp in a factory, however, they would be liable to a fine of £10. It was the worst type he had ever seen, because the metal terminals were bare and would be alive, and the holders were of screwed-in metal. The Coroner said the fact that Gavin cried out before he collapsed suggested that he had had a shock.

Appointments Vacant.

Probationary assistant engineers in Engineering Department of the Post Office for the Civil Service Commission.

Electrician-in-charge for Hornsey Electricity Department.

Plumber-jointers for Southend-on-Sea Electricity Department.

Salesman, for Triotone Radio Co., Ltd.

Senior meter repairer and tester, for the Gellygaer Electricity Department.

Chief engineering assistant, for the Wolverhampton Electricity Department.

Plumber-jointer, for the Portland Electricity Department.

Electrical mechanician, for the Tanganyika Posts and Telegraphs Department.

Assistant distribution engineer for the China Light & Power Co. (1918), Ltd.

Mechanical and electrical engineering assistant for the Air Ministry.

Civilian station engineers at Royal Air Force stations for the Air Ministry.

(See our advertisement pages to-day.)

Parliamentary News.

Our special Parliamentary reporter records that in reply to a question in the House of Commons, the President of the Board of Trade stated that his department had not had any complaints of the inefficiency of the sound-signalling apparatus carried by cargo and steam ships.

In the House of Commons on May 12th, Mr. Muggeridge asked the Minister of Transport if he was satisfied that there were sufficient safeguards in the Electricity (Supply) Acts to ensure that cheap and abundant supply of electricity which it was the object of those Acts to secure; if he would give a return showing the names of companies which had capitalised reserves, or issued shares to shareholders at less than market price, or had adopted any other method of rendering abortive the statutory limitations of dividends and the sums by which those companies had increased their capital by those means; and what steps he proposed to take to prevent such over-capitalisation or issue of shares under market price in future.

In reply, Mr. Morrison said that, while certain Electricity Supply Companies were subject to a sliding scale relating to price and dividend, there was no general statutory limitation of dividends, but he had power to revise from time to time the maximum prices which the companies were authorised to charge. Figures as to the capitalisation of reserves were being obtained. Circumstances, such as bonus distribution of shares, could be taken into consideration in revising maximum prices under the existing law. He was, however, keeping under observation the whole question of the existing procedure for controlling electricity prices.

Glass Convention.

The first British Glass Convention, held at Bournemouth in September, 1928, was such a success that a second convention of the British glass industry will be held at Buxton from September 17th to September 20th. Mr. Walter Chance is to preside over the proceedings, and the chairman of the Convention will be Mr. S. B. Bagley. Full details of the programme can be obtained shortly from the hon. secretary, Mr. G. Marchand, M.A., Aldwych House, Aldwych, London, W.C.2.

National Safety Congress.

A National Safety Congress is to be held at Liverpool (May 20th to 22nd) at which public safety from industrial and traffic points of view will be dealt with. The Congress will be opened by the Duke of York (President of the Association) and Viscount Brentford (chairman) will take part. Among the speakers will be Sir Henry P. Maybury and Mr. Robert Beveridge, Inspector of Lighting and Cleansing, City of Edinburgh, and member of the Council of the Association of Public Lighting Engineers, who will read a paper entitled "Street Lighting and Illuminated Traffic Signals in Relation to Prevention of Accidents." Visits will be made to Messrs. Lever Brothers' works at Port Sunlight and to the Liverpool Docks.

Royal Institution Endowment.

The research work of the Royal Institution will be materially assisted by an endowment of £20,000 which has been accepted by the Institution from the trustees of the Rockefeller Foundation, on condition that an additional £50,000 be independently secured for the same purpose before June 30th, 1933.

The aim of the Institution is to secure a sufficient sum to maintain the work of research, without recourse to Government assistance.

Sir William Bragg, Director of the Laboratory, is in America, where he is to receive the Franklyn Medal of the Franklyn Institute of Philadelphia, the highest honour which American science has to offer.

The Recording of Daylight.

An account of the photo-electric daylight recorder at the National Physical Laboratory, Teddington, is given in the correspondence columns of *Nature*.

The apparatus measures visual daylight, excluding sunlight, since it is skylight rather than sunlight which is of importance in the natural illumination of buildings. At present the illumination is recorded only from the north octant of the sky, but apparatus is being constructed whereby that from each

of the four octants (N., S., E. and W.) will be recorded, fitted with an adjustable screen to cut out the strip of the sky which forms the sun's path. The measurement of illumination from definite areas of the sky involves the use of screens, the size of which governs the size of the aperture of the photo-electric cell; the photo-electric cell used has a window only one inch in diameter. The photo-electric current not being large enough to operate a thread or pen-and-ink recorder, photographic recording is employed.

The cell used is a potassium hydride neon-filled cell operated at 60 volts—or less in bright weather—and as it is used well below its glow voltage (180 V) the sensitivity remains remarkably constant. A Wratten K3 filter is used in conjunction with the cell, and throughout the normal range of daylight colours this combination acts as if its colour sensitivity were identical with that of the eye. The cell is mounted on the flat roof of a high building, together with the energising battery, and two long rubber-insulated ignition cables lead to the recorder in a lower room. The installation of the battery close to the cell enables both the two long leads to be practically at earth potential, instead of one being at a potential about 60 V higher than the other, as would be the case if the battery were housed in the recording room. The calibration is effected from the visual measurements made with an N.P.L. illuminometer thrice daily.

Switchgear Kinema Films.

An exhibition of kinematograph films relating to research work on oil circuit breakers (British Brown-Boveri, Ltd., and A. Reyrolle & Co., Ltd.), followed by a pictorial film of the electrified St. Gotthard railway is to be witnessed by invitation at the St. James' Picture Theatre, London, to-day, May 16th.

Golf Competition.

The Begbie Challenge Cup, competed for annually by the Committee of the Engineering and Allied Employers' London and District Association, was won at Richmond Golf Club on May 6th by Mr. A. Vines, president of the Committee and managing director of Messrs. Evershed & Vignoles, Ltd., with a score of 150 for two rounds.

Developments in Electrolytic Processes.

A lecture given by Prof. Billiter to the Society of Austrian Chemists is referred to in *Nature*. It is stated that whereas it was generally supposed twenty years ago that electrolytic methods would gradually be replaced by thermo-electric processes, it is now realised that electrolysis is destined to play a leading part in technical operations in future. Amongst the processes which are carried out in aqueous solutions the following are described: the refinement of copper, the extraction of zinc, the electrolysis of water, and the preparation of hydrogen peroxide. The increased demand for pure water, which is needed for electrolytic operations and for filling accumulator cells, has led to the development of methods of purifying water by electro-osmosis, which yields a purer product than distillation. Important progress has also been made in the use of molten electrolytes, particularly fluorides, by means of which the technical production of beryllium has become possible, and improvements have also been made in the extraction of sodium and aluminium. Sodium can now be obtained from the molten chloride, and aluminium is refined by the electrolysis of molten fluoride to a higher degree of purity than was possible with the older process. The use of molten fluorides in electrolysis is rapidly becoming more common.

Alloy for Cable Sheaths.

Our attention has been drawn by Mr. W. E. Warner to a discovery made by the British Non-Ferrous Metals Research Association that the introduction of cadmium into the alloy used for the lead coverings of cables is beneficial, and should help to prevent cable breakdowns due to the deterioration of the lead sheaths.

One of the suggested alloys consists of 98.25 per cent. lead, 1.5 per cent. tin, and 0.25 per cent. cadmium. A second alloy, which, however, offers less resistance to corrosion than the former, consists of 99.25 per cent. lead, 0.5 per cent. antimony, and 0.25 per cent. cadmium. Both these alloys have been accepted by the G.P.O. and the Admiralty.

Bradford Engineering Society.

At the twenty-second annual dinner of the Bradford Engineering Society held on May 2nd Mr. Thomas Roles, M.I.E.E., engineer and manager, Bradford electricity undertaking, was the honoured guest of the evening. In proposing the toast of "The Society," he said the time was coming when an engineer should have some definite status such as a charter might confer, and closer collaboration between engineering societies would be beneficial.

During the evening a presentation of a pewter tray and a tea service was made to Mr. H. Unwin, the retiring president.

Bunker Fires.

The Fuel Research Board (Special Report, No. 5) has investigated the causes of 336 fires in bunkers and cargo coal in 272 vessels. No less than 86 per cent. of those fires are attributed to causes that could have been avoided by taking proper precautions. The remainder (14 per cent.) can be accounted for only by spontaneous combustion.

It is suggested that hot pipes should be removed from bunkers and holds, and that ventilating systems should be designed so as to avoid leading air into large masses of coal in confined spaces. Bulkheads should be maintained in a sound and tight condition, and certain precautions should be taken in the loading and trimming of coal.

Floodlighting "Railway House."

The sensational character of the controversy which raged over the matter and manner of Epstein's sculpture on St. James' Park Underground Railway building has, perhaps, caused others of its fine features to be overlooked. Predominant among these features is the tower, the first stages of which rise from the flat roof of the tenth floor. Simple in conception and free from ornate decoration, the tower is floodlighted on its four sides by means of B.T.-H. floodlight projectors located on the roof. These projectors provide the general illumination, while smaller lighting units are used to counteract shadows on the receding frontages. On two sides of the tower there are porticos, and similar reflectors are housed at the bases of the columns to increase the intensity and minimise the flattening effect which would otherwise be apparent on the pillars. B.T.-H. rectangular floodlight lanterns located close to the building face illuminate

Floodlighted Tower on "Railway House."

the base of the tower. This floodlighting installation was designed by the illuminating engineers of the Edison Swan Electric Co., Ltd., in conjunction with the architect. The accompanying illustration is a view of the floodlighted tower taken from the roof.

Historical Pageant at Stoke-on-Trent.

Next week is to be a great week for the City of Stoke-on-Trent, for there will be held the Josiah Wedgwood Bi-Centenary Celebrations, in connection with which there is to be an historical pageant. An important event of the week will deal with the Saint whose life was so closely associated with the district, Saint Chad, and the King of Mercia, Wulfhere, and the murder of the King's Sons at Stone (whose electricity supply comes from Stoke) in the middle of the seventeenth century. The part of the Christian wife of the King (Queen Erminilda) is being taken by Miss Harrison, of Maer Hall, on three days, and by Mrs. Yeaman, wife of Mr. C. H. Yeaman, City electrical engineer, on the opening day, Monday, when Princess Mary will be present at the pageant, the following day, and Thursday.

The electricity undertaking will hold an electrical exhibition in the Fenton Town Hall (one of the seven in the city) during Pageant Week, and this will be open daily from 10 a.m. to 9 p.m., free to the public. The Town Halls of Burslem, Hanley, and Tunstall, the Stoke Electricity Offices (St. George's Chambers), and the headquarters of the N.W. Midlands Joint Electricity Authority (York Chambers) are being decorated and illuminated by the City Electricity Department during the week, so that the electricity supply will be well represented and to the fore.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The British Electrical Development Association has sent Lieut.-Colonel W. A. Vignoles, D.S.O., M.I.E.E., director and secretary of the Association, on a tour of the United States. He will be accompanied by Mr. H. T. Young, A.M.I.E.E., governing director of Messrs. Troughton and Young, experts in modern lighting design. Colonel Vignoles will study policy and public relations in the electrical supply industry in the United States. The visit will include attendance at the annual conference of the National Electric Light Association which is being held this year in San Francisco. Recently Mr. Young has done a great deal of successful pioneering in architectural lighting design. The design of showrooms for electrical appliances and the value of display are subjects in which he has specialised. He has travelled widely to investigate first-hand the methods employed by other countries, and his intention on this visit is to study chiefly methods employed in the United States for the equipment of large buildings, theatres, hotels, and film studios.

Lt.-Col. W. A. Vignoles (left) and Mr. H. T. Young (right), who left on Wednesday for a tour in the U.S.A.

A number of officials in the Liverpool Electric Supply Department are recommended for special payments in view of additional duties and responsibilities which have been placed upon them in the carrying out of the scheme for the erection and equipment of the Clarence Dock power station. During the period of construction annual payments as follows (not exceeding two years) are proposed: Mr. H. Midgley, chief technical assistant, £125; Mr. J. Hamilton, superintendent engineer of generation, £100; Mr. L. Breach, chief electrical assistant, £75; Mr. E. L. Morland, superintendent engineer of distribution, £50; Mr. A. C. Hansen, engineer's secretary, £50; Mr. H. A. W. Williams, station superintendent, £50; Mr. K. M. Ferguson, assistant boiler house superintendent, £50; Mr. S. R. Holloway, shift engineer, £40; and Mr. H. Pryce Jones, assistant technical engineer, £30.

The Galway electricity undertaking has been taken over by the Irish Free State Electricity Supply Board, and last week the employés of the Galway Electric Co. were entertained to a farewell social reunion by the managing director, Major S. Perry, who in the course of the proceedings was made the recipient of a salmon-fishing rod and outfit in token of the very happy relations that had always existed between the company and the employés.

Mr. Thomas Mensforth, works manager with the Darlington Rolling Mills Co., Ltd., has been appointed electrical engineer with Dorman, Long & Co., Ltd.

Reference is made in our "City Notes" to-day in the report of the South Wales Power Co., to the acceptance by Mr. J. W. Beauchamp of an important position under the Central Board in the area and the West of England. The chairman said that the company parted with Mr. Beauchamp with great regret and great reluctance, as in the short time that he had been with them they had formed a very high opinion of his ability and keen energy.

Mr. Albert Gent, for ten years with Rawtenstall Corporation tramways, and previously with Accrington tramways, has been appointed assistant engineer to the Reading Corporation tramways.

The General Electric Co., Ltd., announces that, owing to ill-health, Mr. P. Howard has resigned his position as general manager of its Singapore branch, and that Mr. R. C. Giggins, of its Kuala Lumpur branch, has been appointed to fill the vacancy.

Mr. G. C. Hadfield, manager of the showroom of the Southport Electricity undertaking, has resigned on securing a similar appointment with the Nottingham Corporation. A successor is to be appointed at a commencing salary not exceeding £320 per annum.

We are enabled, through the courtesy of Mr. P. R. Belling, writing from Cairo under date May 1st, to publish the accompanying very interesting photographic group. Readers will recognise (grouped from left to right) Mr. and Mrs. H. W. Clothier, Mr. and Mrs. R. A. Chattock, Mr. C. R. Belling, and Mr. and Mrs. F. Tandy. The Island of Crete is in the background. This distinguished electrical party was at the time on the s.s. *Otranto* intent upon exploring the hidden mysteries of the east, and elucidating problems such as: (1) Can the smouldering fire of Stromboli compete in efficiency with its more modern "Belling" brother? (2) Is it true that the Pyramids were erected to keep the Pharoahs in wireless contact with the rest of the world? (3) How did the ancient Gods control the Goddess "Electra" and safely handle the million volt discharges of Zeus from Mount Olympus? (4) Is there any hidden source of energy in the east that can compete in efficiency with the Hams Hall power station?

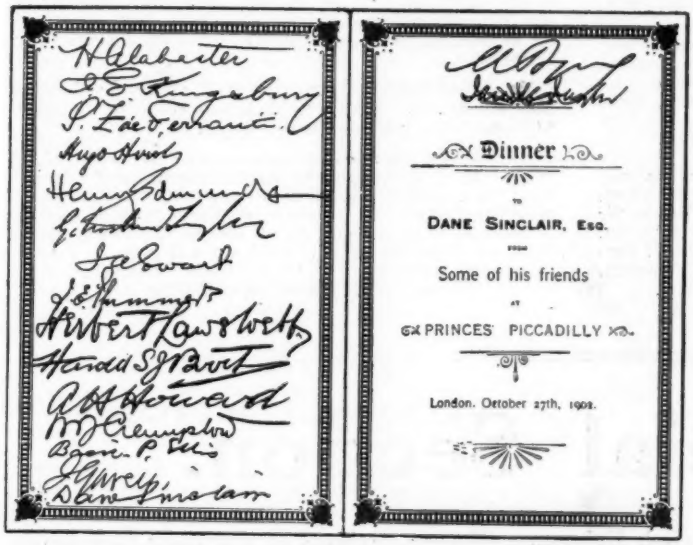
Photo by Marine Photo Service Co.]

From left to right:—Mr. and Mrs. H. W. Clothier, Mr. and Mrs. R. A. Chattock, Mr. C. R. Belling, and Mr. and Mrs. F. Tandy.

On board the "Otranto" off the Island of Crete.

Mr. OUBRIDGE, late of Messrs. Brook Motors, Ltd., for many years their representative and Bristol manager for the West of England, has been appointed agent for Messrs. Wright (Electric Power Specialities), Ltd., late Wright Motors, Ltd., of Halifax, for the same area.

Congratulations to Sir Hugo Hirst, Bart., chairman of the General Electric Co., Ltd., upon winning the 2,000 Guineas Stakes last week with Diolite by two lengths in record time. (Jockey: Fox; trainer: Templeman.) Diolite is confidently expected to win the Derby. There was a record field of 28 runners. Sir Hugo's success was a very popular one. He has been interested in the turf for a number of years.



Menu Card of a Dinner given in honour of Mr. Dane Sinclair in October, 1902.

Mr. JOHN ROBERTS has relinquished his position of engineer and branch manager for Messrs. Johnson & Phillips, Ltd., in the Southern area, which he has held for well over a quarter of a century, and has taken up a position as engineer and branch manager for Southern England for Messrs. District Transmission Lines, Ltd. His new address is 30, Prudential Buildings, Portsmouth.

When the Prince of Wales visits Sunderland on July 3rd he will probably unveil in the hall of the Central Public Library a bronze tablet to the memory of Sir Joseph Wilson Swan, whose centenary was celebrated last year, and who was born at Sunderland. It is hoped to raise sufficient funds to establish a local scholarship and a national lectureship.

The Lord Chancellor and the President of the Board of Trade have appointed Mr. J. G. ARCHIBALD to be a member of the Committee on Restraint of Trade in place of Mr. W. E. Mortimer, who has resigned.

The Lord President of the Advisory Council for Scientific and Industrial Research has appointed SIR ERNEST RUTHERFORD, O.M., Pres. R.S., to be chairman of the Advisory Council of the Department of Scientific and Industrial Research in succession to the late Sir William McCormick, G.B.E., F.R.S., as from October 1st, 1930. Professor V. H. Blackman, F.R.S., will serve as chairman until October.

Obituary.

Mr. Dane Sinclair.—As briefly recorded in our last issue, Mr. Dane Sinclair passed away at his residence, "Oakwood," Weybridge, on May 6th, at the age of 78 years. He had been in failing health for some time past. He leaves a widow, four daughters and a son, Mr. D. Johnstone Sinclair, who is a director of British Insulated Cables, Ltd., of which company his father had been chairman since 1927.

Mr. Dane Sinclair was born in 1852 at Caithness, and the whole of his life was spent in connection with telegraph, telephone, cable manufacturing, and other associated interests. His electrical career commenced in 1872 in the telegraph department of the North British Railway, and three years later he was sent with several other men to Japan for work in the erection of telegraph lines. He was appointed Inspector of Telegraphs by the Japanese Government, and in recognition of his valuable services the Mikado conferred upon him the Distinguished Order of the Rising Sun, Third Class. When he returned to this country after five years in Japan he was appointed engineer to the National Telephone Company for the Glasgow district. Shortly afterwards the three principal telephone companies in Great Britain were amalgamated into the large concern which retained the name of the National Telephone Company, and Mr. Sinclair was asked by the directors of that company to furnish a comprehensive report on the equipment and working of the whole enlarged system. His report formed the basis upon which a complete reorganisation was carried out, and it laid down the lines of policy on which the operations of that company were successfully conducted. Mr. Sinclair became London manager of the company in 1892 and from that year until 1902 he was engineer-in-chief of the entire system. That position he vacated in order to take up the post of general manager of the British Insulated and Helsby Cables, Ltd., at the invitation of the late Mr. James Taylor. To mark this important event in his career "Some of his friends" gave a dinner in his honour at Prince's, Piccadilly, London, on October 27th, 1902. We are able to reproduce a copy of the menu card of this function which was preserved by the late Mr. Henry Alabaster. For some of our readers the signatures will possess a more than ordinary interest. A number of the "Friends" are no longer with us, but others, bearing honoured and well-known names, still carry on their activities—long may they continue them! From the year 1902 down to the day of his death Mr. Sinclair was associated with the British Insulated Cables, Ltd., first as general manager, later as general manager and director, and the great growth made by the company is a matter of general knowledge in the industry at home and in the markets abroad. Its record during the past few years includes important railway electrification work in India and Australia, the Mid-Scottish Grid, and other undertakings. He became chairman of the company in 1927 on the death of Mr. James Taylor, J.P., and combined the post of managing director with the chairmanship until July, 1928, when in view of his many years of strenuous work he relinquished the more active duties of managing director in favour of Mr. G. H. Nisbett. In the development of the Automatic Telephone Manufacturing Company, which was originally a subsidiary of British Insulated Cables, Mr. Sinclair displayed great experience and skill. On his recommendation the Strowger patents were acquired, and he was active in promoting the use of this system for automatic telephone equipment in many towns in Great Britain and in various foreign countries.

He was a director of the following companies:—British Insulated Cables, Ltd. (chairman); St. Helens Cable & Rubber Co., Ltd.; Midland Electric Corporation for Power Distribution (chairman); Automatic Telephone Manufacturing Co., Ltd.; International Automatic Telephone Co., Ltd.; Enfield Cable Works, Ltd.; Electric Supply Co. of Victoria, Ltd. (chairman); and the National Telephone & Telegraph Corporation.

Dorothy Wilding [*London.*

The Late Mr. Dane Sinclair.

The generosity of Mr. Sinclair was experienced by the electrical trades in a marked manner. He made a ready and timely response to appeals from his friends on behalf of the Electrical Trades Benevolent Association, whose committee

will remember his telegraphed reply to an appeal from the late Mr. T. E. Gatehouse asking him to become one of ten to donate £100 each. This was in the less prosperous days of the E.T.B.I., and since then he has rendered valuable assistance to the Fund both by public speeches and in other ways.

A correspondent writing to the *Times* pays him a high tribute for his kindly disposition, integrity and genuine character, which endeared him to a large circle of friends. "His," says the writer, "was a nature unspoiled by prosperity, and he proved a ready friend to all in adversity." We are sure therefore that we shall be expressing the feelings of the whole electrical industry when we offer our sincere sympathy to his widow and family in their bereavement.

The funeral took place at Wick, Caithness, on Friday last, it having been preceded on the previous day by a service at the Weybridge Congregational Church. In conformity with the wishes of Mr. Sinclair the order of service, which was conducted by the Rev. H. D. Budden, included the reading of the twenty-third Psalm. Among those present at the memorial service, in addition to members of the family, were the Hon. Sir Arthur Stanley, Mr. J. A. Smith, Mr. G. H. Nisbett, Mr. J. Ferguson, Sir Thomas and Lady Callender, Sir J. Fortescue-Flannery, Capt. Sir Malcolm Fraser, Mr. Th. Petersen, Mr. E. M. Malek, Sir George Sutton, Bart., Mr. P. Rosling, the Earl of Verulam, Mr. F. Plutte, Sir Alexander Gibb, Sir James Devonshire, Mr. Ll. B. Atkinson, Dr. Eric Gardner, Mr. Lackie, Mr. H. Allcock, Mr. W. Kerfoot, Mr. B. Welbourn, Col. C. B. Clay, Mr. G. F. Preston, Mr. H. Evans, Mr. E. C. Jeffereys, and many others.

A silent and touching tribute was paid to Mr. Sinclair's memory when the cars conveying the remains and the mourners halted for a short time outside the company's offices, Surrey House, the Embankment, on the way from Weybridge to Euston Station

Sir Benjamin Longbottom.—Supplementing our notes of last week, Mr. E. Preece informs us that the late Sir Benjamin Longbottom served his apprenticeship under his tutorship with Messrs. Andrews & Preece, Ltd., mechanical and electrical engineers, at Borough Mills, Bradford, from 1893 to 1894.

Mr. A. M. Ireland.—The death took place on May 7th, at the age of 48 years, of Mr. Arthur Michael Ireland, who was in business as an electrician at Chelmsford. Previously, for 25 years he was on the outdoor staff of the Electric Supply Corporation.

Mr. James Patrick Ryan.—The death occurred suddenly on May 5th of Mr. James Patrick Ryan, who was in business as an electrical contractor in Wanstead, Essex.

Mr. M. B. Field.—With reference to the death of Mr. Michael B. Field, reported in the Electrical Review for February 21st, 1930, it should be recorded that at Glasgow on May 12th Malcolm Cuthbertson, chauffeur, was sentenced to 18 months' imprisonment on a charge of having knocked down and killed Mr. Field. Evidence was given to the effect that Cuthbertson was under the influence of drink. A verdict of "Guilty" was returned by a majority.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Stratford Wireless, Ltd.—Private company. Registered May 6th. Capital, £600 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric and wireless apparatus and appliances, wireless, electrical, mechanical, and general engineers, &c. The first directors are: F. R. Horwood, 54, Romford Road, E.15, electrical engineer (director, Morris Electrical Co., Ltd.); H. Bowman, 30, Sutton Court Road, Chiswick, radio engineer. F. R. Horwood is managing director. Registered office: 284, High Street, Stratford, E.15.

Wycombe Electrical Supplies, Ltd.—Private company. Registered May 9th. Capital, £1,000 in £1 shares. Objects: To acquire from R. C. J. Gilbert the business of an electrical and radio engineer carried on by him at 51, Oxford Street, and 101, Oxford Road, High Wycombe, as the "Wycombe Electrical Supplies." The directors are: R. C. J. Gilbert and Mrs. Margaret Gilbert, both of 51, Oxford Street, High Wycombe. Registered office: 51, Oxford Street, High Wycombe, Bucks.

Belmay, Ltd.—Private company. Registered May 10th. Capital, £100 in £1 shares. Objects: To carry on business as retailers of and dealers in gramophones, wireless apparatus, electrical fittings, &c. The subscribers (each with one share) are: W. H. J. Mayes, 1, Bexhill Road, East Sheen, electrical engineer; C. F. Bell, 341, High Street North, Manor Park, E.12, electrical engineer. The first directors are not named. Registered office: 269, Upper Richmond Road, East Sheen.

Woodstock & District Electrical Distribution Co., Ltd.—Registered as a public company on May 12th, with a nominal capital of £10,000 in £1 shares. The objects are to acquire the Woodstock Electricity Special Order, 1928, and the undertaking authorised thereby; to adopt an agreement with the Woodstock Power Syndicate, Ltd., and to carry on the business of electricians, mechanical engineers, manufacturers and workers of and dealers in electricity, motive power and light, &c. The first directors are: Sir Thomas O. Callender, Bidborough Court, near Tunbridge Wells (managing director of Callender's Cable & Construction Co., Ltd.); P. V. Hunter, Springhurst, Shirley Church Road, Addington (joint manager of Callender's Cable & Construction Co., Ltd.); A. E. Farrow, "Braeside," Ledgers Road, Slough, electrical engineer. Qualification: £100 shares or stock. Remuneration: £100 each per annum (chairman £150), and 5 per cent. of the net profits in each year when 6 per cent. is paid on the ordinary shares, divided between them. Secretary: H. Foulds. Registered office: Hamilton House, Victoria Embankment, E.C.4.

A. F. Dunkley & Co., Ltd.—Private company. Registered May 12th. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical engineers and contractors heretofore carried on by A. F. Dunkley and W. A. Ellis at 115, Northdown Road, and 16, Ethelbert Road, Margate. The directors are: A. F. Dunkley (managing director), Hillbrow, Upstreet, Kent; W. A. Ellis, Midhurst, Avenue Gardens, Margate (both permanent, subject to each holding £10 shares). Secretary: F. L. Hewlett. Solicitor: M. Borg, 6, Cecil Square, Margate.

Roberts (Kent), Ltd.—Private company. Registered May 12th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers, wireless and mechanical engineers, &c. The directors are: R. E. Hiseman (managing director), 19, Wellington Crescent, Ramsgate, Kent; C. H. Roberts, 10, St. George's Road, Broadstairs (both permanent). Secretary: E. H. Ovenden. Solicitor: M. Borg, 6, Cecil Square, Margate.

Bagdad Light & Power Co., Ltd.—Registered as a public company on May 10th, with a nominal capital of £100,000 in £1 shares. The objects are to adopt an agreement with the Bagdad Tramways and Electric Lighting Syndicate, Ltd., to take over and turn to account a concession granted by the Government of Iraq to the Société Anonyme Ottoman des Tramways Eclairages et Forces Electriques de Bagdad dated June 2nd, 1928, or any other concession, licence or order granted by the said government and the property and assets comprised in the agreement; to construct, establish and work in Iraq or elsewhere electric power stations or other public works and undertakings for the generation, distribution, supply and employment of electrical energy, and to carry on the business of an electric light and power company in all its branches. The first directors are: W. B. Cownie, 19, Pembridge Square, Notting Hill (managing director of Bagdad Tramways & Electric Lighting Syndicate, Ltd.); J. G. B. Stone, Muir House, Broadwater, Worthing, stockbroker; C. P. Serocold, 32, Davies Street, W., ditto; J. van Hœgærden, Chateau d'ougree, Ougree, engineer; A. Pirard, 22, Avenue Emile Duray, Ixelles-Bruxelles, engineer; Baron Paul de Launcit, 28, Avenue rogier, Liege (director of St. Ame. d'Enterprise General de Travaux); R. Richard, 52, Avenue Brugmann, Ixelles-Bruxelles, engineer. Solicitors: Johnson, Jecks & Colclough, 24, Austin Friars, E.C.2.

Tamworth District Electric Supply Co., Ltd.—Registered as a public company on May 9th. Capital, £150,000 in £1 shares (50,000 6 per cent. cumulative preference and 100,000 ordinary). Objects: To acquire that part of the undertaking of the Pooley Hall Colliery Co., Ltd., which consists of electricity distribution business and assets (including the Polesworth & District Electricity Special Order, 1929), and to carry on business as an electric light, heat and power supply company, &c. The directors are: D. Chaytor, Pooley Hall, Polesworth, Tamworth; C. E. Stuart, Lyndon Lodge, Polesworth,

Tamworth; J. C. Chaytor, Polesworth Hall, Tamworth; G. R. J. Parkinson, M.I.E.E., The Old Parsonage, Stourbridge; C. R. Heathcock, Thornleigh, Stourbridge. Secretary: E. J. Garner. Registered office: Polesworth, Warwickshire.

Electrohomes, Ltd.—Private company. Registered May 9th. Capital £1,000 in £1 shares. Objects: To acquire the business of electrical appliance manufacturers carried on by the Technical & General Trust, Ltd., at 52, Bedford Street, Strand, W.C. The subscribers (each with one share) are: E. C. Midwinter, 27, Augustus Road, Southfields, S.W.19, engineer; R. W. Sparkes, 12, Riverdale Road, East Twickenham, Middlesex, secretary. The first directors are to be appointed by the subscribers. Registered office: 47, Essex Street, Strand, W.C.2.

Biafone Co., Ltd.—Private company. Registered May 3rd. Capital, £4,000 in £1 shares (1,000 7 per cent. cumulative preference and 3,000 ordinary). Objects: To acquire the business of a manufacturer of electrical apparatus carried on by M. E. Elliott at Gosford Road, Beccles, as the Automatic Radio Manufacturing Company. The first directors (to number not less than three nor more than five) are: W. Gale, Station Road, Beccles, restaurant proprietor; M. E. Elliott, The Thistles, Kemps Lane, Beccles, engineer; L. Gale, and H. S. Alexander, addresses not stated. Solicitors: Norton, Peskett & Forward, Lowestoft.

Official Returns of Electrical Companies.

Peter Raven & Co., Ltd.—A. W. Watson, of 5, Waterloo Street, Birmingham, was appointed receiver on April 10th, 1930, under powers contained in debentures dated November 7th, 1929.

T. V. Rosewarne, Ltd.—S. W. King, of 32, Matheson Road, Kensington, W., was appointed receiver and manager on April 28th, 1930, under powers contained in mortgage or charge dated March 28th, 1925.

Rolyat Electrical Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 18th, 1930, to secure £1,000. Holder: Mrs. M. D. Taylor, 11, Furzedown Market, Tooting, S.W.17.

Painter & Madew, Ltd.—Mortgage on 10, Albion Street, Hanley, Stoke-on-Trent, dated April 15th, 1930, to secure £800. Holder: Alice Madew, 60, Thistleberry Avenue. Newcastle-under-Lyme.

Harmonic Radio Co., Ltd.—Debenture dated April 15th, 1930, to secure £400, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. E. E. Kynaston, 172, Trent Boulevard, West Bridgford.

Celestion, Ltd.—Land registration charge dated March 24th, 1928, on freehold land and buildings in Bear Gardens, Southwark (property acquired March 28th, 1929) on which £13,000 was owing on November 1st, 1929. (Now registered pursuant to Section 91 of the Companies Act, 1929.) Mortgagees: F. E. Newman and J. V. Newman, both of Rose Alley, Park Street, Southwark, S.E.

North Wales Power Co., Ltd.—Twelve mortgages dated March 7th, 1918, to July 24th, 1924, charged on certain properties in the County of Carnarvon (properties acquired July 29th, 1929) on which £20,600 in all was owing on November 1st, 1929. (Now registered pursuant to Section 91 of the Companies Act, 1929.) Mortgagees: H. J. Pell, c/o Chamberlain, Johnson and Parke, Trinity Square, Llandudno, and others.

Weston Electric Lamp Co., Ltd.—Particulars filed of £800 debentures authorised April 28th, 1930, constituting a second charge on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

W. Robson & Sons, Ltd.—P. Taggart, Incorporated Accountant, of 30, Lord Street, Liverpool, ceased to act as receiver and manager on April 16th, 1930.

Morley Electrical Engineering Co., Ltd.—Capital, £5,000 in £1 shares. Return dated February 24th, 1930. All shares taken up. £3,980 paid. £1,020 considered as paid. Indebtedness in respect of mortgages and charges, £2,285 19s. 10d.

Nordisk Electrical Power Co., Ltd.—Capital, £10,000 in £10 shares. Return dated December 31st, 1929. All shares taken up. £20 paid. £9,980 considered as paid. No mortgages or charges registered.

Vulco Dry Battery Co., Ltd.—Capital, £8,000 in 1,500 preference and 6,500 ordinary shares of £1 each. Return dated January 6th, 1930. All shares taken up. £3,667 paid. £4,333 considered as paid. No mortgages or charges registered.

City Notes.

South Wales Power Co.

The annual meeting of this company was held on May 9th. Mr. W. H. Lewis (chairman), who presided, in presenting the report and accounts (ELECTRICAL REVIEW, May 2nd, p. 836), said that the improvement in trade in the basic industries of the district upon which the company so largely depended had been disappointingly slow. Notwithstanding these difficult conditions, the sales of electrical energy had risen from 65½ million kWh to over 76 millions. The revenue received by the statutory company had, however, only increased by about 3 per cent., this being due to a drop in the average price received of 11 per cent. following on reductions in the rates charged to consumers. During the year under review a new 25,000-kW generating plant was put into commission at the Treforest power station. With the addition of this unit, the total up to date capacity of the Treforest station amounted to 62,000 kW. A number of new power supply contracts had been entered into, and others revised and extended. The increase in the company's business for the year was represented by 940 new consumers (the principal one being the Rhondda Tramways Co.), 75 public lamps and an additional ten miles of mains and cables had been erected. A substantial increase in the energy sold might be expected in the current year, and, in addition, several power contracts of importance were in a promising state of negotiation, although they might not become operative for some months. During the past year they had entered new territory for general lighting and small power business, including Llanharry, Ystradowen, and Coychurch. The company had put into use a travelling showroom which paid regular visits to isolated districts for the service and advice of the consumers. The power station at Treforest, the distribution system consisting of 356 miles of lines, and other equipment had been maintained in first-class condition. It was anticipated that South-West England and South Wales scheme would be adopted by the Central Electricity Board in a few weeks, and they had reason to understand that Treforest station would become a "selected" station under the scheme. Their engineer and general manager, Mr. J. W. Beauchamp, had accepted an important position under the Central Board in the West of England area. They parted with him with great regret and great reluctance, as during the short time he had been in their employ they had formed a very high opinion of his ability and keen energy. They had for some time been in negotiation with important British interests controlling a number of electricity supply companies with a view to facilitating the provision of capital for the further development of their areas of supply and to effect further economies in working. Those negotiations were proceeding satisfactorily, and it was hoped in the near future to submit a scheme which would enable the company to make more rapid progress and to take the fullest advantage of its improved position arising from the expected selection of the power station, the change in frequency of supply, and to enable them to proceed with extensions over important parts of their area so far undeveloped. The report and accounts were adopted.

Bournemouth & Poole Electricity Supply Co., Ltd.

The annual meeting of this company was held on May 8th. Lord Erskine, who presided in the absence of Sir Harry Renwick, presented the report and accounts (ELECTRICAL REVIEW, May 9th, p. 880), and read the chairman's speech. The chairman said that during the year substantial reductions in the rates for supply to consumers had been made. In the middle of 1928 a reduction of 1d. per kWh was made in the charge for lighting, and during 1929 the rates for power, heating, and cooking were reduced, and two-part tariffs were introduced for both domestic and business premises. An announcement had now been made of a further reduction in the lighting flat rate, to operate during the current year. The effect of the two-part tariffs was that in the last quarter of the year nearly 850,000 kWh were sold under these tariffs. Regarding the extension of tenure of part of their undertaking, negotiations were still proceeding with the local authorities concerned. They had added to the generating station and extended their mains in every direction, so that the supply was available from Hamworthy in the west, to Highcliff in the east, a distance of over 15 miles, and to Kinson in the north. The extension of tenure referred only to those areas over which the local authorities had the option to purchase in 1932 and 1941. They had other areas outside the borough boundary, and further extensions were pending for areas adjoining. The new undertakings acquired by them last year had made substantial progress, and in these cases, it was intended under their programme of development, to supply all these undertakings in bulk by transmission lines from Bournemouth. Regarding the current year, for the first three months, there was an increase of over 50 per cent. in the kW applied for, as compared with the corresponding period last year, and, similarly there was an increase of over 12 per cent. in the energy sold and 57 per cent. in the number of new consumers connected. The report and accounts were adopted.

Brush Electrical Engineering Co., Ltd.

The report and accounts for 1929 show that after providing for general charges, maintenance of plant and buildings, interest on debentures, &c., and £16,289 for depreciation of buildings and plant, there remains a net profit of £58,988. This sum is allocated as follows: To general reserve, £5,413; to ordinary dividend (10 per cent.), £48,743; further 4 per cent. interest on prior lien participating second debenture stock, £2,044; and to surplus account for apportionment between stockholders and co-partners, £2,787. During the past year the sum of £5,359 has been distributed out of the undivided profits account, being part of the total accumulations added to this account under the co-partnership scheme during years 1926, 1927, and 1928. The members elected to receive £2,971 in the form of fully-paid ordinary stock of the company at par, and £2,389 was paid in cash. After the deduction of £5,359 and the addition of the members' proportion of surplus for 1929 (£490), the undivided profits account stands at £77,947. Out of the amount of £9,838 16s. 4d. allocated to the co-partners in respect of the surplus of the year 1928, £8,058 was taken in the form of fully-paid ordinary stock of the company at par. The issued share capital of the company was converted into stock, and has been increased by the amounts mentioned above. It now stands at £487,430. The general reserve now stands at £260,218.

Ever Ready Co. (Great Britain), Ltd.

The report for the year ended March 31st last records a profit of £244,555, as compared with £210,167 in 1928-29. The addition of £30,696 brought forward makes £275,251 available. Of this £30,000 is placed to reserve and donations and staff benevolent fund absorbs £1,272, leaving £243,980. A final dividend of 25 per cent. is recommended on the ordinary shares, making 35 per cent. for the year, as for 1928-29, leaving £34,000 to be carried forward. The capital expenditure on the expansion of the factories and equipment of the company, and of the subsidiary companies of which it holds the entire capital, amounted to £35,571, and since March 31st last further capital expenditure for the same purposes, amounting to £30,000, has been sanctioned, and the work put in hand. The report states that an extraordinary meeting will be held after the annual meeting when the directors will submit proposals for increasing the capital to £1,000,000 by the creation of 1,000,000 ordinary shares of 5s. each.

Electrical Finance & Securities Co., Ltd.

The report for the year ended December 31st last shows a balance, after deducting debenture interest, &c., of £24,090, to which is added £5,337 brought forward, making £29,427. It is proposed to pay a final dividend of 6 per cent., making 10 per cent., for the year, and a bonus of 2½ per cent., leaving £9,881 to be carried forward. The report states that a further £53,200 of debenture stock has been issued since December 31st last, ranking, *pari passu*, with the existing 5½ per cent. debenture stock, and provision has been made for the interest and sinking fund charges in respect of this issue to December 31st, 1929. Reference is made to the progress during the year of the following electricity supply companies in which the company is interested: the Northwood Electric Light and Power Co., Ltd.; Foots Cray Electric Supply Co., Ltd.; the Colne Valley Electric Supply Co., Ltd.; the Boston & District Electric Supply Co., Ltd.; and the Lothians Electric Power Co.

Richmond (Surrey) Electric Light & Power Co., Ltd.

The accounts of this company were abstracted in our last issue, p. 880, and the annual meeting was held on May 8th. Mr. R. B. Renwick presided, in the absence of Sir Harry Renwick, and read the chairman's speech, in which he stated that the results from a revenue point of view were satisfactory, having regard to the low average rate they were receiving for supplies, to severe trade depression, and to the mildness of the winter. The new connections and the energy sold showed a satisfactory increase, and the figures for the first three months of the current year were also satisfactory. The change-over from d.c. to a.c. was taking place and a large part of the area had already been completed. The report and accounts were adopted.

Anglo-Portuguese Telephone Co.

The directors have decided to offer 143,515 ordinary £1 shares at par to the ordinary and "A" ordinary shareholders in the proportion of one new share for every five held on May 7th. Interest will be paid on the new shares for six months ending December 31st, 1930, at 8 per cent. per annum, less tax, but they will not be entitled to any other dividend for 1930. The new shares will rank for dividend from January 1st, 1931, and will from that date be identical in every respect with the existing ordinary with the exception of any final dividend for 1930. Interest on the new shares will be paid in April, 1931, on the same day as any final dividend for 1930 on the existing ordinary.

Carmarthen Electric Supply Co., Ltd.

The directors have received an offer from the General Electric Co., Ltd., to purchase the whole of the issued ordinary shares together with all the profits or dividends accrued, or to accrue, at the price of 47s. per share in cash, plus interest from January 1st last to date of completion at the rate of 10 per cent. per annum on the nominal value of the shares. The *Financial Times* reports that in a circular to shareholders, the directors state that although another offer has been received, a majority of the directors consider that the offer now submitted is a good one and in the best interests of the shareholders and consumers. Acceptance of the offer is recommended by the Board. The Carmarthen Company supplies electricity to the town of Carmarthen and its issued ordinary capital totals £14,950.

A Large European Combine.

An important transaction is about to be concluded by various European electrical concerns including the International Standard Electric Company, of London, the Phillips Company, of Holland, and the Lorenz Company, of Germany. The Dutch company is to sell its shares in the German company to the British concerns. As the Standard Electric Co. to a certain extent closely co-operates with the Allgemeine Elektricitats Gesellschaft and has control of a number of other German companies, as well as being connected with the American International Telephone & Telegraph Company (Western Electric), the new combine is likely to become a decisive factor in the electricity industry.—*Reuter* (Berlin).

Peterborough Electric Traction Co., Ltd.

The net profit for 1929 was £4,839, as against £4,309 in 1928. After charging bonus to staff (£694), and adding £4,232 brought forward, the available balance is £8,377. A dividend of 5 per cent. is proposed on the ordinary shares (against 10 per cent. in 1928), leaving £5,557 to be carried forward. The report states that the L.N.E. and L.M. & S. Railway companies have acquired a joint interest in the company equal to that of Tilling & British Automobile Traction. A working agreement has been entered into with two railway companies for co-ordination of rail and road interests in the area served by the company.

Lima Light, Power & Tramways Co.

The gross profit for the year ended December 31st last was £P175,204; to this is added £P1,063 brought forward, making £P176,267, and after meeting bond interest and preference dividends, there remains £P89,362. It is proposed to place £P46,000 to amortisation of installations fund, 5 per cent. to reserve, 5 per cent. to directors, and to pay a dividend of 75 centavos on the ordinary shares, leaving £P857 to be carried forward.

Bridgwater & District Electric Supply & Traction Co.

The accounts for 1929 show a profit of £7,126, as compared with £5,081 in 1928, to which is added £1,047 brought forward, making £8,173 available. A dividend of 7 per cent. on the ordinary shares is recommended (6 per cent. in 1928), leaving £1,644 carried forward. The report mentions that the additional capital raised last year was at once utilised for extending the supply to the rural district.

Swansea Improvements & Tramways Co.

The total revenue for 1929 was £135,062 (against £136,546 in 1928), and after deducting expenses, debenture interest, &c., £1,837 payable to Swansea Corporation, and setting aside £20,000 for renewals, there is a surplus of £9,865 (£11,101) which, with the addition of £5,185 brought forward makes £15,050. It is proposed to pay a dividend on the ordinary shares of 6 per cent. (as for 1928), leaving £4,651 carried forward.

Para Telephone Co., Ltd.

The accounts for 1929 show a net profit of £8,926, as against £7,442 in the previous year. A final dividend of 4 per cent., less tax, is paid, making 6½ per cent. for the year (5 per cent. in 1928), and £4,623 is set aside for depreciation, &c., leaving £1,726 to be carried forward.

Baird International Television, Ltd.

A petition is to be heard on May 19th for sanction to the scheme of arrangement for the amalgamation of the company and the Baird Television Development Co., Ltd., and for the reduction of capital from £700,000 to £600,000.

Siemens Bros. & Co., Ltd.

The directors announced a final dividend of 5 per cent. on the ordinary shares, making 7½ per cent. for the year, as for 1928. The dividend is maintained on a larger issued capital

Davis & Timmins, Ltd.

The company is altering its articles so as to provide for the establishment of pension and superannuation funds. A petition for confirmation comes before the Court on May 19th.

German Companies.

The *Mix and Genest Company*, of Berlin, is maintaining at 8 per cent. the rate of distribution for 1929 on the share capital of 16 million marks.

The *Hoppecke Accumulator Company*, of Hoppecke, reports net profits of 132,000 marks for 1929. This wipes out the loss in 1928 and 47,000 marks is carried forward.

The *Felten and Guilleaume Company* reports that despite the unfavourable economic conditions, the orders and turnover in 1929 were about on the level of those in the preceding year. Including the subsidiary concerns the aggregate turnover increased from 225 million marks in 1928 to 245 millions last year. Technical development proceeded in various departments. In the Sound a new 50,000-volt cable was laid, and progress was made in the construction of cables for over 100,000 volts. As recently mentioned the dividend remains at 7½ per cent, as in 1928.

The *Electricity Company* (*late Schuckert*), of Nuremberg, states that the electricity and tramway undertakings in 1929 were less severely affected than other branches of industry by the economic depression which prevailed and the working results were better than those in the previous year. With the beginning of 1930, however, the heavy fiscal burdens on industry and agriculture also began to manifest their effects on the electrical undertakings. The rate of dividend is increased from 11 per cent. in 1928 to 12 per cent. for last year, the net profits having been 6.52 million marks and 6.79 millions in the two years respectively.

It is stated that net profits for 1929 of £454,907, compared with £290,332 for 1928, are reported by the *Electrical Enterprises-Ludwig Loewe Company* ("Gesfuerel"), of Germany, a public utility holding company with international interests. A dividend of 10 per cent. has been declared. The capital was increased at the end of last year on the occasion of the merger of the Electric Enterprises Co. with the Ludwig Loewe Co. £525,868 has been carried forward. The company's holdings include investments in the Compania Hispano-Americana de Electricidad (Chade), Transport, Electricite et Gaz (Constantinople), Compagnies Reunies Gaz et Electricite (Lisbon), and Soc. Internationale d'Energie Hydro-Electricque (Sidro). International public utility interests are represented on the board, which includes Sir Edmund Wyldbore Smith and a number of well-known Continental directors.

Belgian Companies.

The report of the *Société Financière de Transports et d'Entreprises Industrielles* ("Sofina") for the first financial period ended December 31st last shows an income of £803,653 and a profit of £666,956. The dividend on the original ordinary shares is 140 per cent., and that on the new ordinary shares 70 per cent. The managing director of the concern, Mr. D. Heineman, visualises the day when the national electricity networks will be interconnected throughout the whole of industrial Europe. "Powerful steam-driven plants will then have the support of the great 'water strongholds' of Europe —Sweden and Finland, on the one hand, and the Pyrenees, the Central Plateau, the Alps with the Tavern, and the Carpathians on the other—and the electrification of a continent will be assured with a minimum of waste."

The report of the *Société des Ateliers de Constructions Electriques de Charleroi* states that as a result of the flourishing state of industry in 1929 and the extension of the use of electricity in all directions, the company's order books were well filled. It was also possible further to increase the export trade despite the difficulties encountered in foreign markets; the result was that all departments were operated at full efficiency. The net profits amount to 15,646,000 fr., permitting of the payment of a dividend of 42.50 fr. per share.

The *Société d'Electricité et de Mecanique* (Thomson-Houston and Carel systems) reports an increase in the turnover in 1929 that is considered to be important having regard to the economic depression. Among the orders booked mention is made of one for a turbo-alternator of 52,500 kW for Argentina and another for a turbine of 45,000 kW at 3,000 revolutions for the Hainaut Union of Central Stations. The accounts show net profits of Fr.8,880,000 and the dividend is at the rate of 8 per cent.

Dutch Company.

The report of the *Nederlandsche Kabelfabriek Maatschappij*, Delft, Holland, for the last financial year, shows that after setting aside a sum of £29,745 for depreciation the profit amounted to £186,265, as compared with £143,156 in the preceding year. The dividend is being increased from 21 to 25 per cent.

Swiss Companies.

The *Société Franco-Suisse pour l'Industrie Electrique* reports an increase in the profits from Fr. 2,644,000 in 1928 to Fr. 7,340,000 last year, and the dividend on the ordinary shares rises from 18 to 25 francs per share.

British Electric Traction Co., Ltd.

The profits (subject to audit) for the year ended March 31st last amounted to £253,081, as compared with £196,995 in the preceding year. The directors recommend a cash dividend of 5 per cent., less tax, on the deferred ordinary stock, and a bonus of 10 per cent. in fully-paid £1 deferred ordinary shares, being at the same rate as last year. These distributions entitle the holders of the 6 per cent. cumulative participating preference stock to a further 1.89 per cent. by way of participating dividend, making 7.89 per cent. for the year. A balance of £65,547 is added to the undivided profits account.

Stocks and Shares.

TUESDAY EVENING.

THE general aspect of Stock Exchange markets is determined to no small extent by the amount of new issues now being offered. The Bank of England has the right, it is understood, of placing a veto upon what the Bank may consider to be any large loan or issue which may come into competition with other and existing securities. But this does not apply, of course, to the smaller sums asked for, now and then, by ordinary companies. There happens to be a glut of new issues at the present time, for which state of affairs the 3 per cent. Bank Rate is no doubt responsible. The prices of the senior securities are well maintained as a whole, in spite of the fact that the newcomers must offer, naturally, terms that look attractive by comparison. Considerable sums are required for electrical development, more particularly in the Americas and our own country, but, so far as the former source of demand for capital is concerned, the United States Stock Exchanges, while they have recovered to some extent from the effects of the recent slump, are still in a very sensitive state. There has been, however, a material recovery from the lowest prices recently reached.

Home Railways.

Metropolitan Railway 3½ per cent. debenture stock is rather better at 4¼ premium. The railway market as a whole, however, is quiet. Underground Electrics show a disposition to give way. The income bonds eased off to 109. Expansion of the train services of the Underground Railways has increased the demand upon the Lots Road power house, with the result that the Joint Committee finds it necessary to make certain additions to the plant. In consequence, it is proposed to create and to issue a further amount of Metropolitan District and London Electric Railways Joint Power House 4 per cent. rent charge stock, not exceeding £675,000 nominal value, ranking in all respects with the similar stock now outstanding. The price of the latter is 78¼, business having been done earlier in the present month at 78.

New Issues.

No changes worth mentioning have occurred either in Central Electricity Board 5 per cents., which retain their price of 99¼, or in North-West Midlands Joint Electricity authority 5 per cent. stock, 1950-70, at 98¼. West Gloucestershire Power 5½ per cent. first mortgage sinking fund debenture stock is not offered under 98½, this being free of stamp and fee. Interest is payable in the middle of January and July. Scottish Power new shares remain at 1s. premium. North Metropolitan Electric scrip keeps good at 5½ premium.

Cables and Wireless.

Renewed weakness has broken out in the stocks of the Cables and Wireless merger. The "A" and the "B" ordinary, and the 5½ per cent. preference are all down a point. As compared with the prices which obtained when these three stocks were first dealt in, it may be observed that the depreciation is now something like £18,000,000 sterling, an amount which is the more serious by reason of the fact that the stocks, excepting the "B" ordinary, are not regarded as speculative media, but are held by investors who converted, in many cases, their cable stocks into the new merger securities. The main cause of the fall is, of course, the knowledge of the Post Office being a competitor with the Imperial combine; a competitor, too, with the commendation of the Labour Government.

Marconi Marines have recovered to 21/16. The Anglo-Portuguese Telephone Company is making a new issue of shares, at par, 20s., and the present shares are quoted 21s. 9d. ex rights. Bairds are 3s., 22s. 6d., and 6s. 3d. for ordinary, preference, and deferred, respectively. International Automatic Telephones eased off to 33s. 9d.

Electric Construction.

A feature amongst stocks and shares in the group of manufacturing companies was a remarkable jump in Electric Construction shares, the price of which rose from 11s. 3d. to 23s. 9d. The rumours which sprang up to accompany this jump declared that American buyers were keen upon getting control of the company. Nothing official has transpired up to the present to account for the rise in the price of the shares, and, on lack of definite information, the price reacted to 18s. 9d. Last year, it may be recalled, the company issued a disappointing report, the net profit being under £9,000. To pay the preference dividend, a draft had to be made upon the equalisation fund. The last dividend paid on the ordinary shares was 6d., in June, 1929, this making 5½ per cent. for the year. The company's accounting period ends with March, and the report should be out in the course of the next week

or two. Another dramatic rise was secured by General Electric ordinary, the price of the shares jumping from 47s. 6d. to 52s. 6d. before going back a trifle to 51s. 3d. For this the reason was demand from America.

Electricity Supply.

In the market for the Home Electricity supply shares, no alteration of consequence has occurred in the London group. County preference strengthened to 23s., and South Londons at 27s. 6d. have regained the dividend deducted from the price last week. Westminsters and Edmundsons preference are rather better. The provincial shares show a little irregularity. Newcastle-on-Tyne ordinary receded to 23s. 9d. Bournemouth and Poole are easier at £3, while Northamptons at 45s. 9d. are nearly 1s. up. In the gilt-edged group, London Electric debenture put on 3 points, at 97½.

In answer to questions in the House of Commons last Monday night, Mr. Herbert Morrison, the Minister of Transport, said that while certain electricity supply companies are subject to a sliding scale relating to price and dividend, there is no general statutory limitation of dividends. "I have power," he added, "to reduce from time to time the maximum prices which the companies are authorised to charge. Circumstances such as bonus distributions of shares could be taken into consideration in revising maximum prices under the existing law."

The Isle of Wight Electric Light and Power Company announces a net revenue for last year of £28,300, which is about £1,600 less than that of the previous twelve months. The ordinary shares receive their final dividend of 4 per cent., making 8 per cent. free of tax for the year, the same as that paid for 1928. The company's 4½ per cent. redeemable debenture stock is quoted at 88. There is no open market in the shares. At the South Wales Power Company meeting the chairman was able to illustrate the growth of the South Wales Electric Distribution Company, which has made substantial advances in the matter of the sale of units, and this notwithstanding the sluggishness of the trades in the districts which the company serves. The 5 per cent. debenture stock of the South Wales Electrical Power Distribution Company stands at 80, and the 6 per cent. debenture stock of the South Wales Power is quoted at a trifle over 100, the latter company's 6½ per cent. preference shares being 18s. 9d. middle. The ordinary stock is about 55.

The Near West and the Middle East.

The Monmouth Electricity Company is taking over the electricity undertaking from the Monmouth Corporation for £15,000, the Corporation to have the option of repurchasing in 1972 and thereafter. The General Electric Co., Ltd., will subscribe, or obtain subscriptions, for any capital required by the Monmouth Company, the nominal capital of which is £25,000. Three of its directors are on the board of the G.E.C. Amongst recent registrations is the Tamworth District Electric Supply Company, with a capital of 150,000 divided into 50,000 6 per cent. preference and 100,000 ordinary.

Calcutta Electric Supply shares are easier at 47s., showing a fall of 1s. 6d. on the week. The Rangoon Electric Tramway and Supply Company intimated that there had been no loss of life to any of its employés, and, furthermore, that its property had suffered no serious damage by reason of the earthquake.

Manufacturing Companies' Shares.

The report of the Brush Electrical Engineering Company shows a decline in distributable profit of nearly £9,000. The dividend on the ordinary stock is maintained at 10 per cent., but this time there is no additional bonus of 1 per cent., such as was paid last year out of the undivided profits. The directors state it is regrettable that, owing to general depression and keen competition in business, resulting in low prices, the surplus shows a reduction compared with the preceding year. They hope that this setback is only temporary. The price of the stock remains unchanged at 127½. Crompton Parkinsons are better at 23s. 9d. British Aluminium receded to 45s. Johnson & Phillips are easier at 37s. 6d. xd. A fall of £1 has taken Telegraph Constructions to 21½. Babcock & Wilcox have gone back to 55s. xd. The Ever-Ready Company proposes to increase its capital to a million pounds by the creation of a million additional ordinary shares at 5s. each. The company is maintaining its previously paid dividend of 35 per cent., and the preference receive their full 10 per cent. for the year recently ended. The price of the ordinary is a little better at 19s.; the preference are unchanged at 30s. Henleys, Enfields, and Callenders are all 2s. 6d. lower on the week.

Miscellaneous Matters.

Amongst the dollar stocks, Brazilian Tractions enjoyed a recovery of 4 points to 51. Mexicans are a little firmer; Mexican Light and Power second preference hardened to 2¾. Power Corporation of Canada have risen 3 points, to 86½; Montreal Light and Power shares at 130½ are ½ lower. Vancouver Power 4½ per cent. debenture is higher at 82½. American Telephone and Telegraph regained 6 points at 255, but Internationals receded to 64½.

British Electric Traction has moved up 50 to 1,800. Atlas shares are 28s., after having been better. A further fall in Babcocks has reduced the price to 55s. Rubber shares are depressed, along with the market in the raw produce.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1928.	1929.	Price May 13 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3	—1/16	5 0 0
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary	1	8½	8½	27/6	—	5 1 10
do. do. 4½% Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8½	8½	26/6	—	5 5 8
City of London	1	10	10	33/3	—	4 4 6
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	37/-	—	4 6 6
County of London	1	7	10	48/9	—	4 2 0
do. do. 6% Pref.... ...	1	6	6	23/-	+6d.	5 4 4
Edmundson's 7% Pref.	1	7	7	24/6	+6d.	5 14 3
Elec. Supply Corporation	1	11	11	47/-	—	4 13 7
Kensington Ordinary	1	8	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	8½	9	29/6	—	4 15 0
Metropolitan	1	9	10	41/3	—	4 17 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	7	28/6	—	4 16 3
Mid. Elec. Power	1	15	8	32/-	—	5 0 0
Newcastle-on-Tyne Ordinary ...	1	6	6	23/9	—9d.	5 1 1
do. 7% Pref.	1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 4
North Met. Elec. 6% Pref.... ...	1	6	6	22/6	—	5 5 9
St. James' and Pall Mall	1	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	29/-	—	5 3 3
South London	1	8½	8½	27/6xd	+6d.	5 1 10
Urban Ordinary	1	7	7	33/9	—	4 2 10
Westminster Ordinary	1	8½	8½	27/-	+6d.	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	33/9	—	4 14 8

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	77	—	5 4 0
Metropolitan	,,	3½	4	66½	—½	6 0 4
do. District	,,	4	5	77½	—	6 9 0
Underground Electric	£1	7	8	23/-	—	6 19 2
do. do. Income ...	Bonds	6	6	109	—1	5 10 2

TELEGRAPHS AND TELEPHONES

Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 0
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½ Pref.... ...	Stock	—	5½	93½	—1	5 17 8
do. A 7½ Ord.	,,	—	—	51½	—1	... ...
do. B Ord.	,,	—	—	25½	—1	... ...
Globe Tel. and T. Ord.	10	10	10	21½	—	*4 13 0
do. do. Pref.	10	6	6	11½	—	5 9 1
Great Northern Tel.	10	20	20	32	—	6 5 0
Marconi-Marine	1	12½	15	2 3/16	+3/16	7 5 4
Oriental Telephone Ord.	1	12	12	55/6	—	*4 6 9

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	21 3/16	—	9 7 2
do. do. 2nd Pref. ...	5	6	6	2½	—1/16	10 8 8
do. do. 5% Deb. ...	Stock	5	5	70½	—	7 0 0
British Electric Traction Def. Ord.	,,	5	5	1800	+50	... ...
do. do. Pref. Ord.	,,	8	8	126½	—	6 6 6
Brazil Traction	100	7	8	51	+4	3 18 5
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	99½	—	5 7 0
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/-	—	... ...
London United Tram Deb. ...	Stock	4	4	52½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	70	—	7 2 10
Mexican Light Common	100	Nil	Nil	89½	—	... ...
do. 7% Pref.	100	7	7	76½	—	9 3 0
do. 1st Bonds	—	5	5	80	+1	6 5 0
Victoria Falls Ord.	1	15	15	63/9	—	4 14 4
Yorkshire (West Riding)		Nil	Nil	5/-	—	... ...

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	6	26/9xd	—1/	4 9 9
Babcock & Wilcox	1	13	15	55/-xd	—6d.	*5 9 1
British Aluminium Ord.	1	10	10	45/-	—9d.	4 9 0
British Elec. Transformer Pref. ...	1	7	7	8/9	—	... ...
British Insulated Ord.	1	15	15	8½	—	3 17 6
Brush Ord.	Stock	10	10	127½	—	7 17 0
Callenders	1	15	15	8⅜	—⅛	4 3 0
do. 6% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	—	80	23/9	+1/4	6 16 4
do. 8% Pref.	1	8	8	24/6	—	6 10 8
Edison-Swan 1st. Pref.	1	7½	7½	24/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	5½	18/9	+⅛	5 17 4
Enfield Cable Ord.	1	20	20	4½	—⅛	4 14 1
English Electric	1	Nil	Nil	3/9	—	... ...
do. do. Pref.	1	3	Nil	7/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 7
do. Ord.	1	10	10	51/3	+3/9	3 16 0
Henley	1	25	30	6½	—⅛	4 12 4
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	10/-	—9d.	... ...
Johnson & Phillips	1	10	10	1½xd	—1/-	5 6 8
Siemens Ord.	1	7½	7½	25/-	—	6 0 0
Telegraph Construction	12	10	10	21½	—1	*5 8 8

* Dividends paid free of Income Tax.

The Sales Department.

Suggestions for Effective Organisation.

By C. H. DOBELL, A.M.I.Mech.E., AssociateI.E.E.

THE tremendous strides made by electrical undertakings, and the projection and gradual development of the grid, suggest a general discussion on the selling organisation of a supply undertaking, to meet the demands of the future, and to see that no effort is spared in making this an all-electric country. From articles, reports of conferences, and comments in the technical Press it is gathered that this branch of the industry is not such as would place us in the front rank, much less see us pre-eminent, in spite of great efforts made by such associations as the British Electrical Development Association to increase the interest in, and the sales of, electrical appliances and to get the "electrical idea" into the minds of the people.

The duties of a selling organisation can be divided under four headings as follows:—Canvassing prospective consumers both in bulk and individually; attracting and convincing them by practical demonstrations; assisting them to procure the best installations, fittings, appliances, &c.; and giving them service after they have become actual consumers. Each of these would be carried out by a separate section of the sales engineer's department, under the supervision of an expert, under the headings of publicity, showrooms, supply section, and service section. A little study of these sections in turn should lead us to a common policy. As regards publicity, there are two courses open to the supply undertaking in placing this commodity before the public: it may decide to carry out its own advertising campaign, or it may join in a combined effort under the auspices of the Electrical Development Association. The latter seems to be the better way; in fact, it is the bounden duty of all supply undertakings to become members of this Association, in order that every ounce of assistance shall be given to it to continue and enlarge its work for the mutual benefit of all. In such a case the supply authority would undertake its own canvassing, for which it requires a staff of specially trained representatives, capable of advising on all matters affecting the different classes of consumers likely to be met, *i.e.*, residential, commercial, industrial, and rural, but relying on E.D.A. for its sales literature and advertising matter, attractive window displays, &c., in connection with electricity for the home, with which we are dealing for the most part in this article. The primary duty of these representatives is to obtain consumers, and having obtained them, to induce them to take the maximum supply; in other words, to sell electricity, they should not rest content until this has been accomplished in their consumers' houses, offices, factories or farms, as the case may be. A very important function of this section would be to co-operate in an attempt to introduce "Electricity in the service of man" as a subject in the elementary schools, by granting specially favourable terms for electricity and by undertaking to supply lecturers and demonstrators periodically, so that the householders of the future may be primed with a full knowledge of the wonders of electricity, its power, cleanliness, and economy, even before they leave school. Assistance in the organisation of any electrical exhibitions in the area would be another branch of its work and it would also be required to take an important part in any "big push" that might be made in its area by E.D.A. or a similar body. It could with advantage, co-operate with local furnishing stores in campaigns for their mutual benefit. Publicity attains its maximum utility in the judicial use of electric light, therefore one of the greatest means of placing electricity in the forefront of popular thought is obtained by beautifully illuminated demonstration vans travelling over district by district after dark.

The showroom, being the hub, so to speak, of the whole selling organisation, should be the special study of the sales engineer, and his head office should be on the premises. As far as possible he should be close at hand and easily approachable. Contact with his consumers is his first consideration, and that is best accomplished in the four walls of the showroom. Much has been written on the subject of the showroom, its position, display, management, &c., which need not be repeated here, except to emphasise once more that it must take its place among the big shops and stores of the neighbourhood. Its main efforts should be directed to attract and convince the people, and should in no circumstances be regarded, primarily, as a retail shop for the sale of electrical goods. Its aim is higher than that, it should strive to be the meeting place, the recognised rendezvous of the district, on the lines of a free club and rest rooms, a place where one would naturally arrange to meet one's friends, where one could conveniently rest during the weary hours of shopping—warm attractive rooms in winter, cool refreshing rooms in summer, everything done to bring home to these prospective consumers (and, remember, everybody is a prospective consumer) the convenience, cleanliness, and economy of the electric home. Attractive and practical demonstrations should be taking place before the eyes of the shoppers and others who will appreciate and use these rooms; interesting literature on electrical utility should be at hand; and, where possible, there should be periodical exhibitions of films showing the many and varied uses of electricity. An excellent lead has been given by one electricity supply undertaking which has an all-electric restaurant behind its showrooms. There can be no better way of advertising, and convincing the public of the efficacy of electricity as a means of cooking. The showroom staff must be very able salesmen without being shop assistants, and they must be capable of holding the interest right up to the end, without boring visitors or unduly pressing them to purchase. Let us get right away from the shop idea and replace it by an institution of instruction, a bureau of information. Let the electrical idea sink well into the visitor's mind and the sales will come. At the same time we must not lose sight of the fact that there are bound to be consumers who will expect to be able to purchase their needs at the showroom, so that it will be necessary to set aside a portion of the premises for their convenience. No sale must be missed. It is also suggested that a general information bureau, apart from the rest rooms, should be made a very particular feature in our ultra up-to-date showrooms, where inquiries from those contemplating taking a supply, on the subject of the probable cost, the advantages over their existing gas installations, systems of wiring, &c., can be dealt with immediately and intelligently. Everything must be done to make the electricity supply showroom a ruling feature in the every-day life of the inhabitants of the districts which it serves.

The last two duties mentioned above rightly belong to the supply section, whose duty it is to assist consumers by all the means in its power to procure the best installations, fittings, and appliances at a price nearest to that which they are willing to pay and which will compare favourably with those supplied by rival concerns, meaning gas. This section should generally see them through until finally passing the installation and connecting them up to the mains. Co-operation with electrical contractors is effected by this section, and much can be done in this direction. The supply authority should not compete with contractors by running its own wiring department but rather use its knowledge to help the contracting side of the industry. The office of this section should be the centre on which the manufacturer, the contractor, the supply company, and the general public all converge and should be made the medium through which all business is done; it should therefore be situated on the premises of the showrooms. The manager of this section and his staff are in a position to help every branch by seeing that the prospective consumers of the company receive the best possible in the way of advice, appliances, and installations, and that the manufacturers and contractors obtain orders and contracts from them. In the office, there should be available for inspection a register of reliable firms and individuals in the district who carry out wiring contracts, and, if the "prospect" so desires, the section can call for tenders or estimates for any particular work, deal with them when received on behalf of the consumer, and see the work carried through, remuneration being taken on a percentage basis. Assisted wiring schemes can be inaugurated in co-operation with the contractors, and hire-purchase schemes in co-operation with the manufacturers. Householders would prefer to have only one account for all electrical services; therefore, if possible, all their requirements should be obtained through the supply authority, any work put out or appliances purchased being paid for by the authority and the cost recovered from the consumer in his quarterly or monthly account. In the opinion of the writer, wiring by supply companies is very unfair to the general run of contractors, in so much as it is a well-known fact that consumers have often given wiring jobs to their supply company at a higher cost because they imagine that if they were to give them out elsewhere the company would not pass the installations on completion. The supply section of the selling organisation must devote time and energy to co-operation, for it is in the best position to foster the right spirit in all branches of the electrical industry, besides removing the element of suspicion from the minds of the public.

The main concern of the service section would be the nursing of the existing consumers; it must build up a structure of complete confidence between consumer and supplier. The general public is still very ignorant of things electrical, but if close contact is maintained and they are made to feel that the supply authority is with them and ready to help them, they will, undoubtedly, be encouraged to take more and more electricity, especially if risks of failure are reduced to an absolute minimum. Every undertaking has the means at hand in that body of men who, at stated periods, have the entry into the houses of the consumers, *i.e.*, the meter readers or collectors. These men, if rather more technically trained

than at present, could advise them on domestic electricity, could inspect appliances and installations, make small adjustments, and generally forestall complaints and failures. Should it not be found possible for the meter readers to give sufficient time to this work, they could at least be supplied with literature in the form of postcards with printed inquiries on the back, such postcards being divided into classes dealing with the living rooms, bathroom, kitchen, &c., each class having a separate card so as not to confuse the issue in the minds of the consumers. Anyone desirous of increasing his installation or being in any doubt as to the efficiency of his existing arrangements would be presented with the appropriate card for posting to the head office at his own convenience; the receipt of the card at headquarters would be followed by the dispatch of a member of the staff best qualified to deal with the question, to interview the inquirer. By this means he would receive attention at times to suit his own convenience, on subjects which were interesting him at the moment, without being worried with other matters in which he was not interested, thus saving time and money to both parties. Prompt attention to faults when reported is essential and creates a feeling of confidence; a stand-by staff, however small, should be kept in readiness to answer any call with the utmost dispatch.

We should endeavour to prevent consumers being called on by more than one man, except in cases where it is essential as above. The meter readers or collectors should be the connecting link between consumer and company, and their first thought should be to inspire confidence in the minds of their clients. It is quite possible that commercial consumers also would appreciate such a system, but in the case of industry and agriculture it is more probable that, having their own engineers, they would be competent to attend to all their needs unaided, and the company would only be concerned with the delivery of electricity "at their doors." After they had been connected up it is unlikely that they would have much cause to come into contact with the sales engineer's department; they would be more the concern of the distribution or mains engineer.

Although this system as outlined here is perhaps more applicable to large undertakings, it is adaptable to smaller concerns, where the duties of two sections might have to be undertaken by one man, in which case publicity and showrooms are easily merged into one, or showrooms and supply, or supply and service, whichever would appear to be the most efficient to the different undertakings. In conclusion, since it is of the utmost importance that the sales engineer should do all in his power to dispel that suspicion which lies dormant in the minds of the public towards any authority supplying necessities such as light, water, or heat, on account of its monopoly, he should be a good reader of character to enable him to select the right men to fill the various positions arising from the foregoing scheme—men with tact, knowledge, and judgment, who will gain the confidence not only of their employers, but of the general public as well, with the result that the electricity supply undertaking will be considered the friend of man, with a corresponding increase in the use of electricity.

Church Lighting Problems.

St. Mary's Church, Portsea, has been recently Equipped for Electrical Illumination.

IT is not to be expected that the designers of ecclesiastical edifices, built in the days when electric lighting was practically unknown, should have looked forward to the possibility of electrical illumination from concealed sources, or, for that matter, to any system of electrical illumination whatsoever. The lack of foresight, though pardonable, does, however, present difficulties to those illuminating engineers who specialise in church lighting. Quite apart from the distribution of light for illumination purposes, there is the all-important question of the design and placing of the apparatus, and where it is impossible to conceal the lighting units a presentable and sympathetic system must be employed.

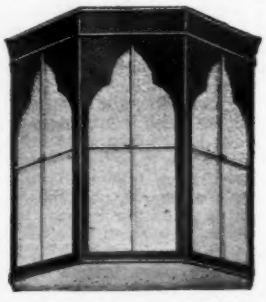


Fig. 1.—Type 1018 B.T.H. Fitting.

Fig. 2.—Nave Illumination.

An example of the efficient solution of such a problem is St. Mary's Church, Portsea. The lighting of this large church, which has seating accommodation for 2,000 people, presented some unusual aspects.

With a roof height of 70 ft. and a nave 120 ft. long, and with a general lack of adequate concealment for lighting equipment, there was some difficulty in determining the best way of handling the situation. Decorative pendant fittings were not only unsuitable for the building, but prohibitive on the score of cost. Eventually it was decided to employ B.T.H. type 1018 wall lanterns, fig. 1, placed just below the clerestory windows on the north and south walls of the nave. Each lantern is equipped with a 500-watt regular gasfilled lamp in a modified form of rectangular angle reflector, and the front of the lantern is glazed to protect the eye.

Fig. 3.—Choir Stalls Lighting.

The lanterns are of a design which is in keeping with the surroundings, and the light is satisfactorily distributed. The sources of illumination are approximately those of natural light, so that the natural shadow effects are preserved.

The aisles, choir stalls, and sanctuary are lighted by means of B.T.H. type 455 projectors with 300-watt gasfilled lamps.

The lighting scheme was designed by the Illuminating Engineering Department of the Edison Swan Electric Co., Ltd., and the contractors were Messrs. Barnes & Co.

Ship-shore Radio-telephony.

A brief review of some of the technical aspects of the recently-inaugurated intercommunication service between ocean-going ships and land-line networks.

By Col. Sir THOMAS F. PURVES, President, I.E.E.

(Extracts from an address delivered before the STUDENTS' SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.*)*

(Concluded from page 886.)

Land-line Connection.—The radio transmitter is connected to the land lines through equipment which includes a volume indicator, a gain amplifier which can be varied, and a variable attenuator, so that the transmitter can be fully modulated by the normal line currents.

The procedure of making a call is as simple as that of any long-distance trunk call. The charge for the service is £4 10s. for three minutes, plus £1 10s. for each additional minute, and is the same whatever the position of the ship on the Atlantic Ocean. The land end of the circuit is terminated in the London trunk exchange, and to the telephone operator who establishes connection there is little to differentiate the "radio-wire" circuit from the hundreds of others represented by jacks on the switchboard.

Fig. 14.—Radio Terminal Racks.

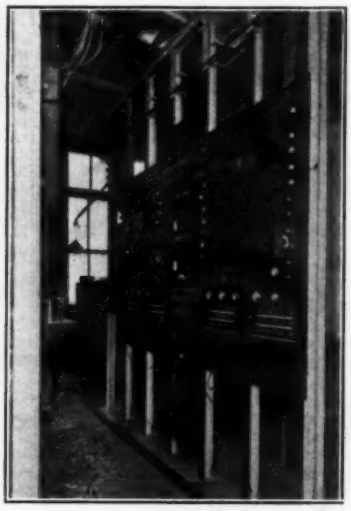


Fig. 15.—" Voice-operated Device " Racks.

The overall circuit is the equivalent of a four-wire circuit; that is, separate paths as used for transmitted and received speech. The connection from Rugby to London is by 85 miles of underground cable, and Baldock is connected by over 30 miles of underground cable to London. At control points, both at London and on the ship, are stationed skilled technical operators who continually observe the circuit while it is in commercial service. It is at this point in London that the two sides of the four-wire circuit are combined into a two-wire channel which can be connected to the ordinary telephone system of the country. On the ship separate pairs of wires are used for the two sides of the circuit and are connected directly to the telephone instrument in the special call box, one pair to the transmitter and one pair to the receiver.

One of the most important duties of the technical operator is to see that the outgoing volume of speech is constant and such that the transmitter is always fully modulated, to ensure that the audio signal received on the ship is a maximum at all times and that there is, therefore, a maximum ratio of signal to noise. The volume is controlled by a potentiometer device on the input to an amplifier, or repeater, having a gain of 40 decibels, *i.e.*, a voltage step-up of 100 times. The measurement of volume is made with a direct-reading valve voltmeter of the anode-bend type.

The ordinary four-wire telephone circuit has a multiple transformer at each end for combining the two sides of the four-wire circuit into a two-wire channel. It has four windings (fig. 18); coils A and B are connected to the transmitting and receiving lines, respectively, while coil C is connected to a resistance balancing network and D is joined to the sub-

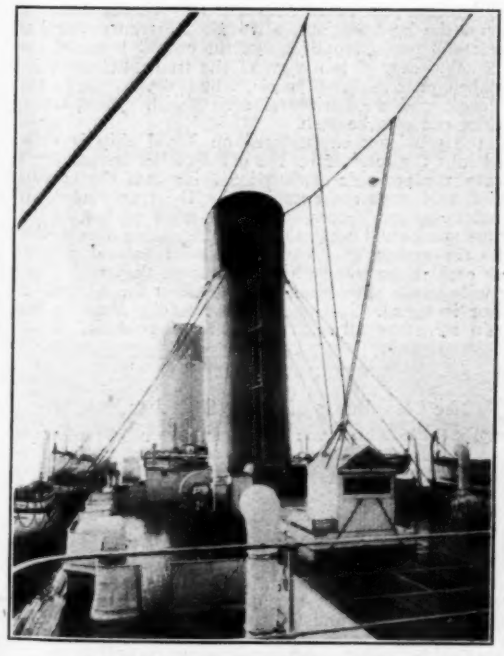


Fig. 16.—Reception Cabin and Aerials.

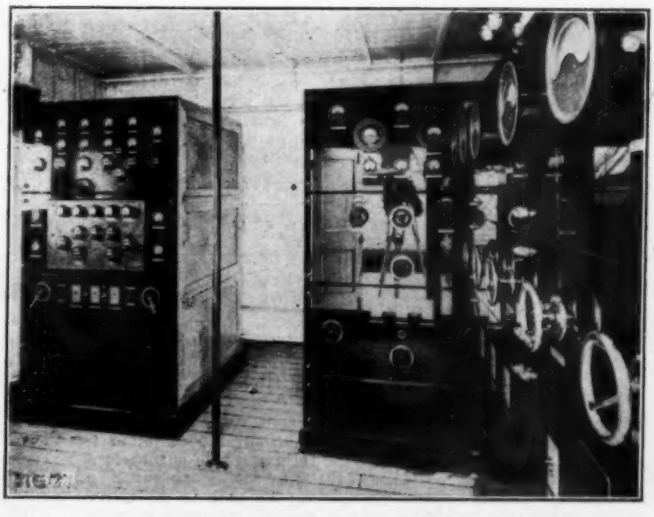


Fig. 17.—Transmitting Plant aboard R.M.S. " Olympic."

scriber's line. If the impedance of the network is equal to the impedance towards the subscriber's telephone, there is no transmission from the receiving side to the transmitting side, although transmission is possible from B to D and from D to A with little attenuation. In practice, however, the impedance of the subscriber's circuit will differ from that of the resistance balance, balance will not be accurate, and a certain

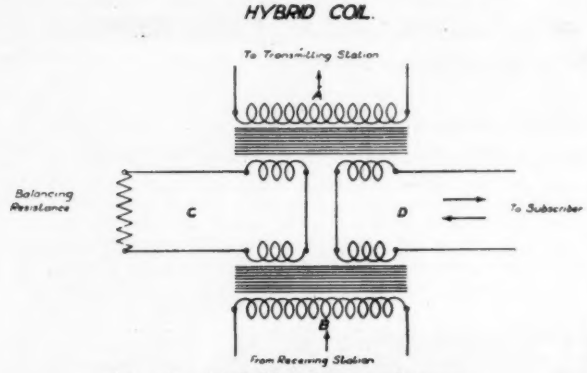


Fig. 18.—Hybrid-coil Transformer.

amount of speech will therefore pass from the "receive" leg to the "transmit" leg, *i.e.*, from B to A. Therefore radio noise picked up by the receiver would pass to the transmitter and be re-radiated along with the speech of the land subscriber, with a degrading effect upon reception on the ship. Speech from the ship would also be radiated and have the undesirable effect of allowing an eavesdropper to hear both sides of the conversation, as he would only need to tune to the frequency of one transmitter.

The Post Office Engineering Department has perfected a "voice-operated device" which, in conjunction with the hybrid coil, prevents this defect. It consists, essentially, of a number of thermionic valve relays, and fig. 19 shows a very simple type adapted to this purpose. Valves A and B are in a push-pull circuit and biased normally to the mid-point of their characteristics by a battery, when no current flows through the resistance E. Valve C is an anode-bend rectifier which, with zero input, allows no current to flow through its anode resistance E. On the arrival of speech, or tone, at its grid, however, the anode current rises, a voltage being thus developed across E, which makes the grids of the push-pull valves A and B very negative. The amplifier therefore becomes inoperative, and the passage of speech through it is prevented.

Fig. 20 shows a schematic layout of the terminal equipment; A and B are the 40-*db* gain amplifiers at the technical operator's position; C, D, and F are push-pull amplifiers of the valve-relay type; and E and G are normal two-stage amplifiers having high impedance inputs, such that when tapped across the main circuit no loss of volume is thereby caused; J and H are push-pull rectifiers of the two-electrode type; I is a single valve without grid bias under normal conditions, *i.e.*, the grid is at the same potential as the negative end of its filament, and its anode current flows through the resistance in the grid circuits of the push-pull valves C, thus making that amplifier inoperative.

When a London subscriber talks, his speech passes through A to C and, simultaneously, *via* E and F to the rectifier H. The output of the latter is arranged to make the grids of the valves D and I very negative with respect to their filaments.

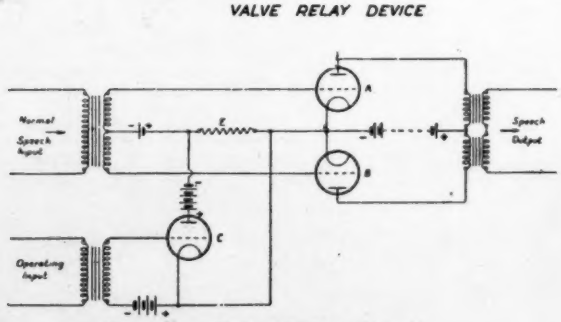


Fig. 19.—Valve Relay Circuit.

The anode current of the valve I therefore falls to zero and in so doing reduces the bias on C to normal; the amplifier D also loses its anode current, and the receiving side is therefore cut off. Thus when the local subscriber talks amplifier C immediately becomes operative, opening the path to the transmitter, while the receiving side is cut off, preventing radio noise from being transmitted with speech. The change-over operation occurs in less than three milli-seconds.

Speech from the ship passes from the radio receiver to the subscriber by way of D, B, and the hybrid coil. Some of the speech is tapped off by G and rectified by J; the output of J prevents amplifier F from functioning, thus preventing speech which has crossed the hybrid coil (due to lack of balance) from opening the transmitting side path.

The apparatus layout for two radio terminals is shown in fig. 14; bays 1, 2, 4, and 5 carry the 4-wire termination for each channel and bay 3 the testing equipment. Immediately behind this rack on 5 corresponding bays is the "voice-operated device" equipment for each channel (fig. 15). A dial for the remote control of the received sensitivity of the "voice-operated device" (dependent upon radio conditions) and a switch for varying its time hang-over for various line echoes and transmission irregularities associated with the local subscriber's connection are also included at the technical operator's position. A telegraph key is provided for use in conjunction with an oscillator to key Morse signals when lining up the circuits.

The gain controller for both repeaters is a variable attenuator with twelve steps of 2.5 *db* each from zero to 30 *db*. It may reduce the overall gain of the repeater by 5 *db* for a strong talker, or increase it by 25 *db* for a weak one. Control is varied in conjunction with the volume indicator and enables the technical operator to load the radio transmitter fully by maintaining a constant level of speech current at this point in the system.

Monitoring facilities are provided for traffic and technical operators at various points in the 4-wire links, in order to check the satisfactory operation of the terminal equipment. The latter, particularly that in London, plays a highly important part in combining the receiving and transmitting radio links and in association with long-distance land lines, which, for some services, often pass through two or three Continental countries.

Commercial Results.—As a typical example of the commercial communication periods obtained, it may be mentioned that on a recent outward voyage of the s.s. *Majestic* the useful period of 10 a.m. to 6 p.m. ship's time was adequately covered.

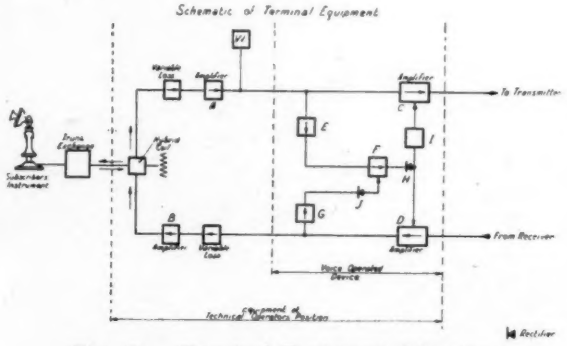


Fig. 20.—Terminal Equipment Diagram.

Ship's Plant.—The crystal-controlled transmitter and receiver equipments on board ship are very similar to those described for the land stations, although the transmitter has one stage less of power amplification, the output being of the order of 2 kW. Fig. 17 is a view of the transmitting equipment installed on R.M.S. *Olympic*, while fig. 16 shows the receiving cabin and the horizontal aerials with spaced transmission lines can also be seen.

One of the problems encountered on board ship is noise introduced into the receiver by the effect of the transmitter's carrier wave, the probable explanation being that the various mast and funnel guys are energised by the transmitter. If they do not make good contact with the main portion of the ship, minute sparks will occur across the insulating film, which will excite the system at its own particular natural period. Since such oscillations will be highly damped, they will interfere over wide bands of wavelengths, including those to which the receiver is tuned. The cure is to carefully bond to the ship's main structure all such elements of potential interference.

The Cleanliness of Knife Switches.

The cleanliness of the contact surfaces of knife-type switches is reflected in the voltage drop across the switch. If the surfaces are dirty and covered with oxide the voltage drop will be large, and will also cause heating of the blades.

The drop across the switch can be tested by a milli-voltmeter, which can be connected across one blade of the switch at a time, the voltage drop being shown by the reading on the milli-voltmeter. In the case of a perfectly clean switch in good order the voltage drop should not exceed ten milli-volts. If the switch surfaces are dirty or out of adjustment this figure will be greatly exceeded and will perhaps be as high as one hundred milli-volts.

For grinding in switch surfaces a paste made of finely powdered pumice and oil is excellent. A similar method can be used to test the efficiency of joints in either bus-bars or cables. If the joint has been well made, the voltage drop across the joint should only be slightly in excess of the drop across an equal length of unjointed conductor of the same gauge.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

All-Bakelite Accessories.

Recent productions of Messrs. A. P. LUNDBERG & SONS, LTD., 477 to 489, Liverpool Road, Holloway, N.7, include an "all bakelite" triple-socket plug, and a similar two-pin plug connector. The triple-socket plug, fig. 1, is suitable for use with surface, semi-recessed and flush patterns of B.E.S.A. standard 5-A sockets, and also with side- and face-entry switch-plugs of the same gauge. The body part is made of one piece of bakelite in which a brass stamping is used for each of the two current-carrying parts. These stampings are so formed that they provide contact tubes for the end-entering plugs, and the contact tubes for the top-entry plug screw directly into contact with them. Lugs are also provided which are threaded to receive the usual pair of contact pins feeding all three "ways." The stampings are inserted, one from each end, in key-hole slots, the whole assembly being done in a novel and effective manner.

Fig. 1.—All-Bakelite Triple-socket Plug.

Fig. 2.—Two-pin Connector.

The two-pin plug connector, fig. 2, is provided with contact pins in the fixed part, and contact sockets in the detachable part, of different diameters, in order to ensure correct polarity in use. The contact pins in the fixed part are arranged below the flange level. A pattern with a nickel-plated flange, and another for loud-speaker use are also made. Other patterns of similar construction are also supplied for surface fixing and extension use.

A Protection Cover for Lead-box Joints.

An invention by Mr. C. P. Seckham, mains engineer, Wakefield Corporation Electricity Undertaking, the "C.P.S." protection cover for lead-box joints, which is being manufactured by Messrs. OATES & GREEN, LTD., Halifax, Yorkshire, is designed to make a sound, quick, and at the same time cheap job of lead service-box work. Provision is made for 1 in. of pitch or compound all round the box, and ribs have been provided in the bottom half of the cover to ensure this. The cover is made of 1 in. brown glazed earthenware, with the top bearing the word "Electricity." The cover can be used with any type of cable, and if desired a short length of trough and cover may be used at the glands, as shown in the illustrations. Fig. 4 shows the lower half of the protection cover in position. The troughs afford adequate protection for the cable entering the glands. Fig. 5 shows a lead joint box and cable in position, and fig. 6 depicts the completed joint, with the lid of the protection cover in position. The covers are made in two sizes.

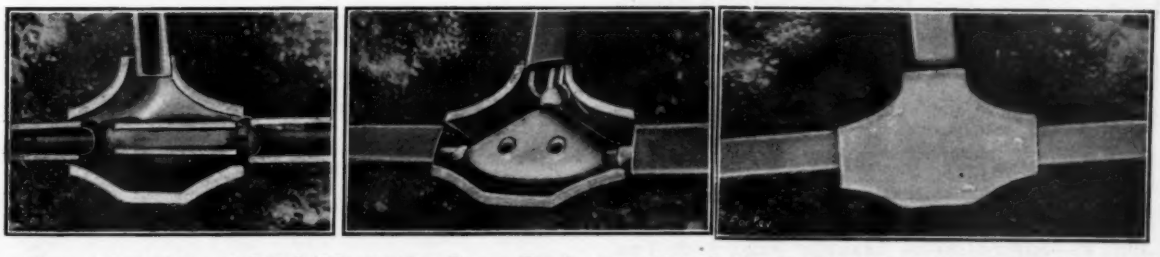
Fig. 3.—"Wardle" Four-way Traffic Beacon.

A Traffic Beacon.

The accompanying illustration, fig 3, shows a "Wardle" four-way electric traffic beacon, one of a range of such appliances recently introduced by the WARDLE ENGINEERING CO., LTD., Elsinore Road, Old Trafford, Manchester. These beacons are manufactured in one-way to six-way models, and they are designed for installation at such places as tramway stops, level crossings, dangerous points in industrial areas, and dangerous road crossings. The body and doors are of silicon-aluminium alloy, 8¾ in. diameter, prismatic lenses being fitted to the doors. The doors are readily detachable from the body. A porcelain b.c. lamp-holder is fitted together with a thermo-electric flasher, operating 20 seconds "on" and 10 seconds "off." The beacons for two or more ways are fitted with prismatic lenses, and single-way beacons are fitted with diffusing lenses and a scientifically designed spun-copper chromium-plated reflector. The standard type is provided with a c.i. spigot cap for pillar mounting. A single-way beacon is also available fitted with an extension arm and cast-iron pole clamps for pole mounting at the side of the road.

Overhead-line Protection from Aeroplanes.

In view of the fact that overhead lines are being erected in many cases throughout the country in close proximity to air routes and flying-club grounds, it is interesting to note that Capt. C. J. Turner, chief electrical engineer, Hoylake electricity undertaking, has provisionally protected an arrangement for illuminating overhead lines where required when there might be danger of aeroplanes coming in contact with power lines when flying low or landing at night. The arrangement does not involve the use of any wiring whatever, but is simply an attachment consisting of a gas-filled luminous tube fixed to any one of the power lines at any point necessary.



Figs. 4, 5, and 6.—"C.P.S." Protection Cover; Ready to receive Cables and Joint Box, Box in position, and completed Joint.

Distribution Protective Equipment.

Descriptive notes on a new range of relays re-designed and introduced by the Salford Instrument Works of the General Electric Co., Ltd.

THE Salford Instrument Works of the General Electric Co., Ltd., has recently re-designed a number of its relays including overload induction relays (with inverse-time elements), super-sensitive leakage relays, reverse-power relays, d.c. moving-coil relays, and so on, and they embody

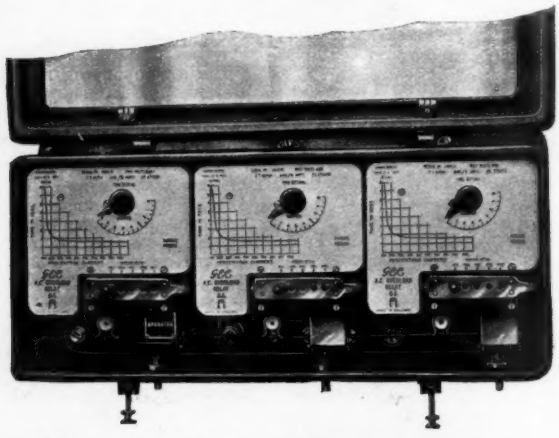


Fig. 1.—Overload Induction Relay with Inverse Definite Minimum Time Element.

many ingenious features of considerable interest. The object throughout in modern distribution work must be to promote continuity of supply by isolating faulty sections, and it was with this aim in view that the latest "Salford" designs of overload induction relays, with inverse definite minimum time elements, super-sensitive leakage relays, and reverse-power relays, were produced. Various combinations of these instruments are also manufactured in self-contained forms.

The specialised and localised form of protection that is given by these relays is illustrated by the overload induction relay (fig. 1), to which is fitted an inverse definite-minimum-time element. This feature allows the mains superintendent to regulate the operation so that either the relay (or relays in the case of a ring-main system) next to the fault is the only one tripped, the remainder of the system being unaffected, or so that the relays will trip in their correct sequence irrespective of the severity of the fault. For currents greater than 1,000 per cent. full-load current, the time of operation is approximately constant. The relay works on the induction principle, and it will withstand overloads of 1¼ times full-load

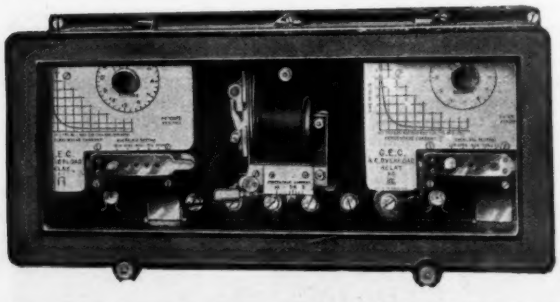


Fig. 2.—Super-sensitive Leakage Relay with Two Overload Inverse-Time Element Relays.

current continuously, and 10 times full-load current for a short time without damage or loss of accuracy; full-load current is 5 A. The settings can be varied independently, the time setting from ½ to 8 seconds, and the current setting up to twice full-load. A patented safety device is fitted to allow the tapping to be changed while the relay is on load, without risk of open-circuiting. If an overload or fault occurs on the system while the current setting is being altered, the relay still carries out its protective functions. The relay is not operated by momentary surges, and if the load falls during the operation it will automatically reset, even at the point of making contact. The power consumed on 50-cycle circuits with normal full-load current is not more than 3.2 volt-amperes. The relay is made in single- and three-pole forms. For use on high-voltage circuits of small current capacity, where bushing transformers are used, the G.E.C. manufactures a specially sensitive form of overload induction relay which imposes a minimum load on the transformer. This relay has all the advantages of the standard form already described, with the addition of reduced power consumption (not more than 1.6 volt-amperes on 50-cycle circuits with normal full-load current).

For leakage protection, a special super-sensitive relay is manufactured which can be supplied combined in one case with two overload inverse-time-element relays (fig. 2), the combination thus giving complete overload and leakage protection to a three-phase circuit, generator, or transformer. Used with shunt-tripping circuit breakers, this relay is able to isolate any faulty circuit and warn the operator of abnormal conditions. The principle of operation is the attraction of a sensitively balanced armature to an electromagnet, when the voltage or current exceeds that for which the relay is set.

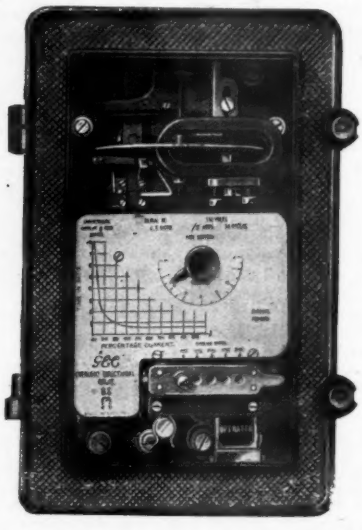


Fig. 3.—Overload and Directional Relay.

When operated from a standard current transformer with a 5-A secondary it will indicate leakages of 5-10 per cent. The power consumption is particularly low—0.03 volt-ampere at minimum setting.

The super-sensitive relays in single-pole form have a wide variety of other applications, including a.c. or d.c. over-voltage or overload protection, &c.

An improved form of the reverse-power relay has been lately introduced, and is constructed on the induction-wattmeter principle; it can also be arranged as a differential reverse-power relay (for reverse power and leakage protection on the McColl system) and has a biased differential relay (for parallel feeder protection). The movement consists of a disk rotating between a pressure electromagnet and a current electromagnet. The value of reverse power at which the relay operates can be varied by an adjustable pointer from zero to 30 per cent. of the normal forward load. The loss in the pressure coil is 0.6—1.5 watts, and the voltage drop in the current coil (at full load) is 0.36 volt. The relay operates instantaneously. In addition to the projecting pattern (rectangular case) a flush pattern in a round case is also available.

For cases in which combined overload and reverse-power protection is desired, a specially designed overload and direc-

tional relay (fig. 3) is available. This relay incorporates an inverse-time-limit overload element and a directional element, mounted in a common case with their circuits suitably connected. The same principles of operation are used as in the overload induction relay and the reverse-power relay, and all the inherent advantages of these relays are maintained.

The latest pattern of d.c. moving-coil relay developed fulfils a variety of functions in a reliable and economical manner. It can be arranged either as a current relay (to give protection against overload and/or reverse current), or as a voltage relay (for over- and/or under-voltage protection). The relay (fig. 4) is operated with shunts in series with the load, and it is generally similar to most permanent-magnet moving-coil instruments, except for certain modifications that give important advantages to the present design. For instance, the much higher working forces greatly increase the contact pressure and the torque of the movement; this ensures very reliable operation and prevents the possibility of trouble from adhesion of contacts. A further advantage is due to a very-low-resistance movement, allowing the use of shunts with a low millivolt drop (*e.g.*, 150 millivolts at full load), which allows economy of power without the reliability being impaired. The overload capacity complies with the appropriate British Standard Specification, and the relay is guaranteed to operate within 4 per cent. of the adjustable current

Fig. 4.—Moving-coil D.C. Relay.

setting. If required, the d.c. overload relay can be fitted with an indicating pointer, so as to serve also as an ammeter.

All the relays are thoroughly tested before leaving the works. They are fitted with standard back connections, aluminium bases, removable aluminium cases finished in bright black enamel, with dull-black stippling on the fronts, and hinged glass-fronted covers.

Smoke Abatement.

At a public conference on by-laws under Section 5 of the Public Health (Smoke Abatement) Act, 1926, held recently, with Dr. H. A. Des Voeux, president, Smoke Abatement Society, in the chair, a paper was read by Mr. Allpass, in which he said that the technique of the treatment of the smoke nuisance had altered little in the last fifty years, but they had at last secured a provision which apparently enabled the root of the evil to be dealt with. It was now possible to take special steps to secure that in certain buildings the arrangements for cooking and heating should be of such pattern, or so constructed, as to prevent or reduce the emission of smoke.

The powers conferred upon local authorities by Section 5 of the Act were too limited in scope, particularly with regard to the County of London, to permit by-laws of real value to be made, and the decision of the Minister of Health as to their purport further restricted their sphere of usefulness.

In the discussion which followed it was suggested that the remissness of local authorities, rather than that of the Minister, should be deplored, and that the attention of every municipality in the kingdom should be drawn to the fact that they had a problem to face, and an opportunity should be given them of making suggestions.

On the proposition of Sir Lawrence Chubb, seconded by Mr. Graham, a resolution was adopted which included :—

"That this Society should secure the co-operation of the Royal Institute of British Architects and the Institute of Civil Engineers in the investigation of the best means of securing that, in all new buildings, furnaces and fireplaces are constructed so as to prevent smoke arising from the combustibles used therein."

Ceylon's Electrical Imports.

Comparative Figures for 1928-29.

THE following table shows the value of Ceylon's imports (including Government stores) of electrical and allied materials during last year. The figures have been taken from the recently published official returns. The corresponding statistics for 1928 have been added, and notes of decrease or increase are also given.

The Colonial Secretary at Colombo recently announced in the Legislative Council that the Siemens Bau-Union, a combination of Siemens-Schuckert and Siemens & Halske, was submitting a proposal to the Ceylon Government regarding the construction of the island's hydro-electric scheme. Local opinion is divided as to the necessity for hastening the commencement of this project, as there are varying estimates regarding the potential demand for electricity. Present economic conditions in Ceylon do not favour the undertaking of large expenditure.

	Rupees. 1928.	Rupees. 1929.	Rupees. Inc. or dec.
Control and switchgear—			
Total, mainly from U.K. ...	39,000	34,000	– 5,000
Generators, alternators and dynamos—			
Total	178,000	132,000	– 46,000
From United Kingdom ...	154,000	124,000	– 30,000
,, Germany	18,000	4,000	– 14,000
,, United States ...	1,000	500	– 500
Motors—			
Total	56,000	83,000	+ 27,000
From United Kingdom ...	50,900	58,000	+ 8,000
,, United States ...	4,500	22,000	+ 17,500
Transformers and convertors—			
Total	3,100	120	– 2,980
(All United Kingdom.)			
Magnetos, ignition—			
Total, all from U.K. ...	175	253	+ 78
Magnetos, road—			
Total	5,400	6,500	+ 1,100
From United Kingdom ...	5,000	5,900	+ 900
,, United States ...	300	600	+ 300
Electric wires and cables (insulated)—			
Total	1,114,000	715,000	– 399,000
From United Kingdom ...	1,098,000	696,000	– 402,000
,, Germany	5,600	4,600	– 1,000
,, United States ...	50	400	+ 350
,, Holland	1,500	5,700	+ 4,200
Electrical machinery not elsewhere specified—			
Total	1,384,000	908,000	– 476,000
From United Kingdom ...	1,213,000	469,000	– 744,000
,, Germany	37,800	202,000	+ 164,200
,, United States ...	94,000	62,000	– 32,000
,, Italy	11,500	*	—
Telegraph and telephone instruments and apparatus—			
Total	390,000	458,000	+ 68,000
From United Kingdom ...	338,000	410,000	+ 72,000
,, United States ...	6,800	5,000	– 1,800
,, Sweden	1,800	900	– 900
,, Germany	25,800	21,800	– 4,000
Electric lighting accessories and fittings, including switches—			
Total	603,000	694,000	+ 91,000
From United Kingdom ...	346,000	401,000	+ 55,000
,, Germany	62,000	51,000	– 11,000
,, United States ...	142,000	167,000	+ 25,000
,, Holland	29,000	32,500	+ 3,500
Electrical goods and apparatus not elsewhere specified—			
Total	628,000	738,000	+ 110,000
From United Kingdom ...	473,000	540,000	+ 67,000
,, India	22,000	21,400	– 600
,, France	400	500	+ 100
,, United States ...	86,000	120,000	+ 34,000
,, Germany	39,000	37,000	– 2,000

* Figures not available.

East-England Electricity Scheme.

Outline of the latest scheme transmitted by the Electricity Commissioners to the Central Electricity Board and published by the latter last week.

In compliance with Section 4 (2) of the Electricity (Supply) Act, 1926, the Electricity Commissioners have transmitted the East-England Electricity Scheme, 1930,* to the Central Electricity Board, which published it on May 7th. It deals with an area of about 3,438 square miles, covering practically the whole of the counties of Norfolk and Suffolk, which at the last census supported a population of approximately 788,880; thus the district is large, but thinly populated, and a peculiarity is that electricity has not hitherto been available in over half of the area. Considerable virgin territory therefore awaits development.

The scheme (the eighth of its kind) is a simple one from the transmission aspect. Secondary transmission and distribution are being entrusted to the East Anglian Electric Supply Co., Ltd.,† and several of the larger municipalities, whose rival proposals have somewhat delayed the preparation of the scheme and prevented its incorporation in the South-East England scheme.‡

At present there are 18 authorised undertakers in the area, owning between them 11 public generating stations. The aggregate maximum load on the undertakings during the winter of 1928-29 was 26,059 kW and is estimated to reach a total of 61,225 kW in 1937-38, being an increase of about 135

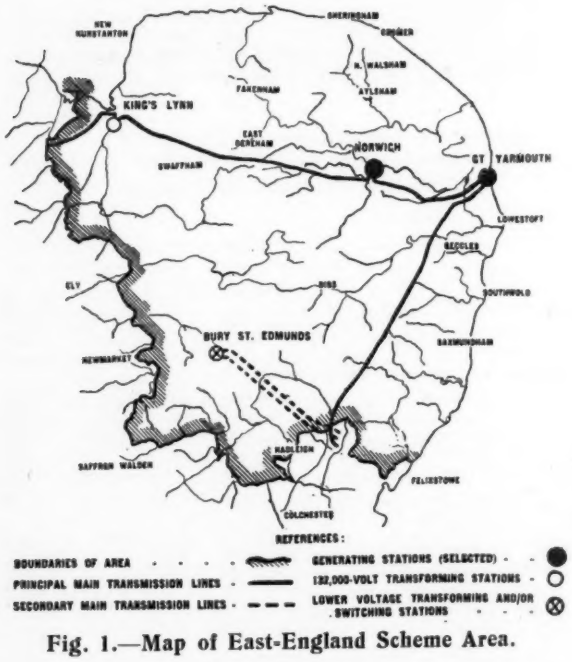


Fig. 1.—Map of East-England Scheme Area.

per cent.; by the winter of 1943-44 it is estimated to amount to 82,500 kW.

The sale of electricity in the area during the year 1928-29 amounted to 48.2 million kWh, or an average of only 61 kWh per head of the population, but is estimated to reach a total of 162.7 million kWh in 1937-38, which will represent an increase of about 237 per cent. during the nine years, or an average of 26.3 per cent. per annum based upon the 1928-29 output, and correspond to a sale in 1937-38 of 206 kWh per head of the population based on the 1921 census.

Between 1922-23 and 1928-29 the growth of consumption was from 20.6 to 48.2 million kWh, representing an average yearly increase of 4.6 million kWh. As compared with this figure, the average rate of increase from 1928-29 to 1937-38 is estimated at 12.7 million kWh per annum. The higher rate of growth and the improved load factor between 1928-29 and 1932-33 are due to a considerable extent to the present and prospective requirements of a factory recently established in the southern portion of the area and representing a relatively important industrial load already operating at a high load factor.

The sale of electricity to consumers in 1943-44, based upon approximately the same rate of increase, is estimated to reach a total of 221 million kWh, representing 280 kWh per head of the population based on the 1921 census.

It is proposed that two existing stations, namely, the South Denes station of the Great Yarmouth Gorporation and the Thorpe station of the Norwich Corporation, will be selected and operated for the Board. Provision is also to be made for the operation, if necessary, of the station of the King's Lynn Corporation under temporary arrangements. Broadly, it is contemplated that the station at Great Yarmouth will carry the base load, and that the remaining requirements will be met by the Thorpe station and possibly in time by means of imported electricity from the areas of the neighbouring schemes. Additions of a.c., 3-phase, 50-cycle generating plant and the equivalent boiler plant are contemplated as follows:—(i) South Denes (where sea-borne coal is obtainable considerably cheaper than elsewhere in the area) 15,000 kW, by the winter of 1932-33; plus 15,000 kW by the winter of 1935-36; plus 15,000 kW by the winter 1939-40; (ii) Thorpe 15,000 kW by the winter of 1941-42.

The accompanying map (fig. 1) indicates the routes of the principal main (132-kV) and secondary main (33-kV) overhead transmission lines (120 route miles in length) to be constructed by the Central Electricity Board, and its four transforming stations will be of the under-mentioned capacities: Great Yarmouth, 60,000 kVA; Norwich, 30,000 kVA; King's Lynn, 10,000 kVA; and Bury St. Edmund's, 5,000 kVA. The lines will join those for which provision was made in the South-East England scheme, thus forming a ring main and consequently giving greater security against breakdown, both in this area and outside it. There will also be a short length of secondary transmission lines which will involve two further transforming stations. Incidentally, the interconnection of the generating stations will (by 1937/38) result in releasing for revenue-earning purposes about 22,580 kW of plant which would otherwise be spare, representing about £383,860 of capital.

The cost of the scheme to the Board for the erection of the transmission system is estimated at £594,328. In addition, there will be an expenditure by undertakers of about £306,074 on the extension of existing stations. It is estimated that the full advantages of the scheme can be secured with a distinct saving on the capital expenditure that would be necessary if the present system of individual development were continued, and the saving of capital expenditure will be progressive.

The Commissioners have outlined a provisional plan of working the stations, with the necessary estimates, which suggestions are, of course, tentative, since the working of the scheme, including the fixing of tariffs, is the responsiblity of the Board; but, taking the figures as they stand, it is of interest to note that the Commissioners estimate that in the five years 1933-1938 there will be a saving to the undertakers in the area of about £218,578.

* Copies of the scheme and of supplementary particulars are obtainable (price 1s. 7d. and 3s. 8d. each, respectively, post free) from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, and 120, George Street, Edinburgh.

† Electrical Review, May 18th, 1928.

‡ Electrical Review, Oct. 7th, 1927, and Feb. 2nd, 1928.

A New Variable-resistance Material.

According to the *Manchester Guardian Commercial*, a new type of material which is both a good insulator and a good conductor of electricity was recently announced at the convention of the American Institute of Electrical Engineers. The material has the remarkable property of changing its resistance to current flow with applied voltage variations in such a way that each time the voltage is doubled the current increases rather more than twelve times. The response to voltage change is very rapid, and the resistance can be decreased to one-millionth of its original value in a time as short as one-millionth of a second. Disks of this material, known as "Thyrite," 6 in. in diameter and ¾ in. thick, were exhibited, they having been made for use in lightning arrestors for the protection of power systems against the damaging effects of lightning surges. Such disks have a resistance of 50,000 ohms when 100 volts is applied to the parallel faces, which resistance decreases to less than half an ohm when the voltage is increased to 10,000 volts. "Thyrite" will carry lightning-discharge currents as high as 30,000 A without signs of distress. The characteristics are permanent, as shown by life tests in which samples have shown no change after carrying current continuously over a period of several years. "Thyrite" resembles black slate, and has mechanical properties similar to those of dry-process porcelain. In manufacture the material is moulded to the required shape and the contact surfaces coated with metal by the "Schoop" metal-spraying process.

Regional Broadcasting Stations.

Some engineering aspects of the design of dual-wave radio-telephony transmitting plant, with particular reference to the B.B.C. station at Brookman's Park.

By P. P. ECKERSLEY, M.I.E.E., and N. ASHBRIDGE, B.Sc.

(*Extracts from a paper read before the* WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE British Broadcasting Corporation's regional scheme involves the construction of several dual-wave transmitting stations, each capable of radiating simultaneously two programmes on different wavelengths with a power of 50 kW in each aerial. The paper describes the first such station erected at Brookman's Park, Hertfordshire, to serve London and the Home Counties,* a particularly interesting feature being the use of e.h.p. motor-generators for energising the valve-anode circuits.

There are to be five centres of dual-programme service, located in Scotland, North (industrial) England, South-East England (based on London), the Midlands, and the South-West (to serve both the West and South Wales areas); two of them have been completed, Daventry for the Midlands and the station under discussion for London and South-East England.

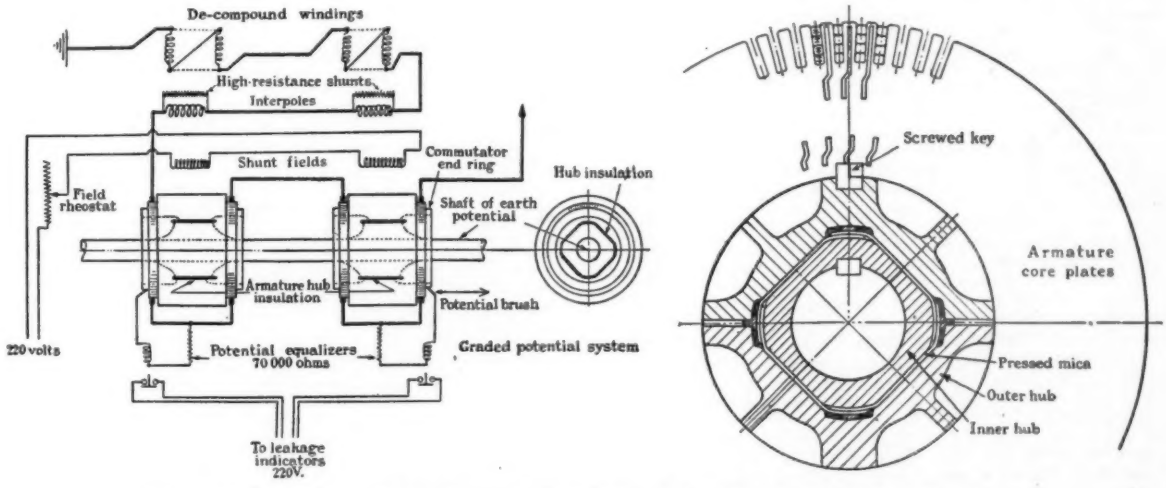
Power Supply.—It was thought advisable to install self-contained electricity generating plant and not to use the public supply mains. "Shut-downs" of considerable duration at broadcasting stations have frequently been due to failure of the public supply mains; moreover, it is possible to generate locally at approximately the same cost as, or in some cases a considerably lower cost than, that at which power can be bought. Further, it is desirable to be able to avoid fluctuations in supply voltage. Accordingly Diesel-engine sets were chosen to generate direct current, so that a storage battery could be used to provide a further factor of reliability in addition to compensating for variations in voltage.

Foundations.—Although the type of engine chosen creates comparatively little vibration, nevertheless it was considered necessary to take every precaution to ensure that no detectable vibration should reach the transmitters. With this object in view the engines were mounted on a single block of concrete measuring 45 ft. 6 in. by 32 ft. by 6 ft. deep, which weighs some 600 tons, and the concrete mixture was so specified that the weight should not be less than a fixed amount. The block rests on a raft, but is insulated from it by blocks of "Corosil" cork mounted in iron frames and given a special treatment to ensure durability. Each frame is approximately 2 ft. 6 in. square, and the cork material is 2½ in. thick. The pressure on the cork is approximately 7.5 lb. per sq. in. Between the foundation block and the retaining walls of the raft there is an air space 3 in. wide, which is closed by removable teak boards, fitted flush with the floor of the power house. The special foundations were designed by Christie and Grey, Ltd., and have proved entirely effective in preventing any perceptible vibration, even in the room which adjoins the power house.

* For illustrated description see ELEC. REV., September 20th, 1929.

Anode Energisation.—It was decided to use e.h.p. motor generators in preference to thermionic rectifiers. The machines were developed to suit the requirements of the station by Mr. J. E. Calverley, of the English Electric Co. Their maximum output is 160 kW at 750 r.p.m., and the voltage range is 7,000 to 12,000, the machines being capable of giving the full 160 kW at any voltage between these limits. The lower limit was chosen to cover the possibility of the machines being obliged to work at a comparatively low voltage on account of so-called "rocky point" effects in the water-cooled waves forming the final power stages of the transmitters. This trouble was somewhat persistent at the Daventry (5GB) station when the design of these machines was under consideration, and at that time the solution was not clear. It was intended to run the machines at approximately 10,000 volts, apart from this consideration, but it might be desirable at some later stage to raise the working voltage to 12,000, since the higher voltage gives improved conditions on the transmitter from the points of view of efficiency and linearity of modulated output.

The driving motor is compound-wound, and the generators are separately excited from the station busbars, the fields of the two generators per set being permanently connected in series and controlled by one regulator.



Figs. 1 and 2.—E.h.p. Motor-generator Insulation and Dielectric Stress Distribution.

The high voltage is generated in two armatures, each having two separate windings in the same slots with two commutators. All four commutators are permanently connected in series. The voltage per commutator can be varied between 1,750 and 3,000 volts with the aid of the field rheostat to give the total high-voltage range required.

Each machine has four main poles and four commutation poles. The yokes and pedestals are split on the horizontal centre-line to facilitate erection. The shafts of all three armatures (one motor and two generators) of the set are rigidly coupled together and carried in four sleeve-bearings with oil-ring lubrication; extra precautions were taken to prevent creepage of oil along the shaft into the machine. The armatures are mounted on very stiff shafts and were dynamically balanced.

The insulation scheme and distribution of the electric stress are probably the most interesting features of the machines (see figs. 1 and 2). Neither the couplings nor the foundations are insulated, the frames, shafts, bearings, and bedplate being at earth potential. The English Electric Co.'s graded-potential system was adopted, the object of which is to remove the heavy electric stress from the slot insulation and apply it to a secondary layer of insulation built into the armature hub. The slot insulation consists of pressed mica 0.06 in. thick, and is subject to a stress having a peak value of 3,000 volts twice per revolution, equivalent to an a.c. voltage of 2,120

at 24 cycles per second. The stress on the slot insulation is identical in both armatures, though one is operating in series with the other, the system being earthed on the negative side.

The major insulation to earth is incorporated in the armature hub, and consists of pressed mica 0.125 in. thick, held between solid machined surfaces, and projects beyond the armature hub to give a long creepage surface to earth. The layer was made up of four overlapping sections moulded to shape and fitted round the inner hub, which is of square section with rounded corners (see fig. 2). The armature hub in halves was assembled in position on the mica and secured by a shrink-ring at each end. To eliminate the possibility of films of air in any spaces between the mica and the steel, the moulded sections were given a good coating of insulating compound, which was maintained in a fluid condition until the shrink-rings were in position and the hub complete. The insulating material in this position is very solid and is remote from any appreciable temperature variations. Each hub was tested to the shaft at 25,000 volts, 50 cycles, for one hour before the armature was wound.

The armature core with its hub carries also the commutator hubs, one at each end, so that the whole of the armature and commutators are well insulated from the shaft. The potential of these parts is maintained at its correct value, relative to the armature windings, by means of a potential equaliser, two for each pair of generators, one for each armature; they are totally enclosed and mounted on the bedplate. The connections to the insulated armatures are made through a carbon brush running on an extension of one commutator and ring on each armature core. The potential equaliser maintains the potential of the armature core at a mid-value between the extreme potentials of the two commutators, and definitely determines the electric stress across the slot insulating material, the remaining voltage to earth being applied to the armature-hub insulating material.

The resistance of the potential-equaliser circuit is 70,000 ohms, which limits the fault current in the event of a breakdown of insulating material. If any current exists in this resistance due to leakage, or insulation breakdown, a relay connected in series will close two contacts on a low-potential circuit and operate the leakage-indicator gear.

All highly-inductive windings connected in the high-voltage circuit, such as interpole coils and series windings, have reinforced insulating material on the end turns of each coil to safeguard them against breakdowns between turns due to surges or impulses. The interpole windings are provided with non-inductive shunting circuits to by-pass any audio-frequency currents which may exist in the system.

The interpole coils and series coils are connected on the earth side of the armature, but are insulated for a high-pressure test of 5,000 volts (a.c.) owing to the fact that in certain circumstances higher voltages to earth than normal may exist.

The following high-pressure insulation tests were carried out on the finished machines, using 50-cycle a.c. of 1-minute duration.

Test.	Volts.
Armature windings to armature core	7,500
Armature core to shaft	20,000
Series and interpole windings to frame ...	5,000
Series winding to shunt winding	5,000
Shunt winding to frame	2,500
Potential equaliser and relay coil to bedplate	20,000

Considering that the slot insulating material and the armature hub insulating material are electrically in series, the total final test pressure between the armature windings and earth was equal to 27,500 volts (a.c.).

The overall efficiency of these sets over the working range is from 85 to 86 per cent. The machines comply with B.S.S. No. 168—1923 as regards temperature-rise, even if the maximum rated voltage of 12,000 and the maximum rated current of 23 amperes are taken together.

Owing to the possibility of "rocky point" effects in the main transmitting valves, it was considered desirable to give the machines some form of inherent current-limiting characteristic, and for this reason the generators are heavily decompounded with their own current. As the smoothing system includes a high-value choke coil (5 henrys) in series with the machine, the rate of increase of current due to a short-circuit external to the choke and machine can be made sufficiently small to permit the de-compounding to keep pace with the current-rise.

The total inductance of one pair of machines in a set is about 1.1 henrys, and without the choke in circuit the initial rate of increase in current on short-circuit at the terminals is in the neighbourhood of 5,000 amperes per sec. The de-compounding winding has little effect at the instant of short-circuit, but after about 0.02 sec. (during which time the current is increased by about 100 amperes) the de-compounding becomes effective.

With the 5-henry choke in circuit, the initial rate of increase of current is reduced to about 1,500 amperes per sec., and will not rise to more than about 35 amperes before the voltage begins to fall, due to the action of the series de-compounding windings. As this is the final short-circuit current, when the circulating current approaches this value it remains practically steady whilst the voltage falls to zero. This scheme has been found to be quite effective in service, and a short-circuit in the transmitter room does not cause any appreciable disturbance on the commutators of the motor-generator set.

(To be concluded.)

Forthcoming Conferences.

Brief Particulars of the Official Programmes.

The I.M.E.A.

THE following are the principal events covered by the official programme of the thirty-fifth annual convention of the Incorporated Municipal Electrical Association which is to be held at Eastbourne on May 26th to 31st next. Monday, May 26th: issue of badges at convention office, Winter Garden, Devonshire Park, 10 a.m. to 9 p.m.; reception by the president, Mr. J. K. Brydges, M.I.E.E., borough electrical engineer, Eastbourne, 8.15 p.m. Tuesday: morning, civic welcome by the Mayor of Eastbourne, Councillor Lt.-Col. Roland Gwynne, D.S.O.; presidential address, and a paper on the "Obligations of Electricity Committees" by Alderman R. S. Chatfield, chairman, Eastbourne Electricity Committee; 12.30 p.m., official photograph; 2.30 p.m., official visit to Exhibition; 8.15 p.m., reception by the Mayor of Eastbourne. Wednesday: 10 a.m., paper on "Pulverised-fuel Firing as Affecting Economic Boiler House Operation" by Mr. G. H. Lake, borough electrical engineer, Derby; 2 p.m., visit to the Brighton electricity works. Thursday: 10 a.m., paper by Mr. J. W. Burr, M.I.E.E., borough electrical engineer, Swansea, on "Electric heating of Buildings," followed by informal discussion on domestic water heating to be opened by Mr. A. E. McKenzie, M.I.E.E., borough electrical engineer, Wimbledon; 7 p.m., annual dinner at Grand Hotel. Thursday is also "Women's Day," and the special programme which has been drawn up for this includes, in addition to the morning events already referred to, a luncheon in the Tea Room, Devonshire Park, at 1 p.m., and a visit to the Exhibition at 2 p.m. Friday: 9.30 a.m., council meeting; 10.30 a.m., annual general meeting; 2 p.m., coach trip to Bexhill, Hastings, Winchelsea, and Rye. Saturday: visit to Eastbourne electricity works.

The following companies, &c., will show at the Exhibition:

Bastian Meter Co., Ltd.
Belling & Co.
Berry's Electric (1928), Ltd.
British Electric Transformer Co., Ltd.
Bulpitt & Sons, Ltd.
Burnley Components, Ltd.
Carron Company.
Chesterton Jones & Co., Ltd.
Crabtree, J. A., & Co., Ltd.
Credenda Conduits Co., Ltd.
Domestic Electrification, Ltd.
Dowsing Radiant Heat Co., Ltd.
Drake & Gorham, Ltd.
Eastbourne Corporation Elec. Dept.
E.A.W.
E.C.A. (Eastbourne Branch).
E.D.A.
E.L.M.A.
Edison Swan Electric Co., Ltd.
Electric Fires, Ltd.
Electrolux, Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Green, Geo., & Co.
Horstmann Gear Co., Ltd.
Hotpoint Electric Appliance Co., Ltd.
Jackson Electric Stove Co., Ltd.
Low, Archibald, & Sons, Ltd.
Manor Electric Oven and Fire Co.
Marco Refrigerartors (1929), Ltd.
Metro-Vick Supplies.
Nobbs, Geo., Ltd.
Radiovisor Parent, Ltd.
Revo Electric Co., Ltd.
Reyrolle, A., & Co., Ltd.
Sadia, Ltd.
Santon, Ltd.
Siemens Electric Lamps and Supplies, Ltd.
Tucker, J. H., & Co., Ltd.
Venner Time Switches, Ltd.
Young, Osmond & Young, Ltd.

I.E.E. Summer Visit.

The tentative programme of the summer meeting of the Institution of Electrical Engineers, which will be held at the Irish Centre on June 2nd to 6th, includes the following items: Monday evening, June 2nd: assembly at Gresham Hotel, Dublin; Tuesday: motor trip in Co. Wicklow, including inspection of overhead transmission lines. Wednesday: visit to Shannon scheme, Limerick. Thursday: visit to the brewery of Messrs. A. Guiness, Sons & Co., in the morning, proceed to Belfast by special train in the afternoon, and reception by the Lord Mayor of Belfast (the Rt. Hon. Sir William Coates) at the City Hall in the evening. Friday: a tour of the Harbour and a trip down Belfast Lough on *s.s. Musgrave*; visits to the Harbour power station, Messrs. Harland & Wolff's shipyard, and to York Street Mills; excursion to Glenariffe through Antrim and Ballymena, and reunion and dinner at the Grand Hotel, Belfast, in the evening.

The Tramways Congress.

The 20th annual congress of the Tramways, Light Railways and Transport Association will be held on June 11th and 12th at Hastings. The principal business item on the first day, apart from the annual general meeting, will be a paper, "Notes on Substituting a Trolley 'bus System for a Tramway," by Mr. W. Vincent Edwards, general manager and engineer, Hastings Tramway Co., followed by a luncheon at the Queen's Hotel, given by the Mayor and Corporation of Hastings. Messrs. J. L. Burton and H. H. Andrews will read a paper on "The Tramcar: Present and Future" on the second day, and the annual dinner will be held in the evening.

World Power Conference.

At the second plenary meeting of the World Power Conference which will be held in Berlin on June 16th—25th, there will be presented 132 papers on electricity, 34 on solid fuels, and 33 on gaseous fuels, in addition to others on liquid fuels, steam power, water power, power economics, standardisation, education and statistics. There are 44 British papers to be presented, including "Illumination as a Factor in the Sale of Electricity," by Mr. C. W. Sully; "The Treatment of Flue Gases from Modern Power Stations," by Dr. S. L. Pearce; "The Economics and Commercial Development of Low-temperature Carbonisation in Great Britain," by Dr. C. H. Lauder; and "The British Grid System and its Relation to Certain Technical and Economical Problems," by Sir Archibald Page and Mr. C. W. Marshall; "The Economic Operation of Electrified Railways," by Messrs. C. H. Merz and Francis

Lydall. Visits to places of industrial and historical interest will follow the Conference.

The E.C.A. Convention.

According to the provisional programme of the 5th annual conference of the E.C.A. Allied Associations, which will be held at Llandudno on June 25th, 26th, and 27th, there will be a meeting of the Council of the three Associations (Electrical Contractors' Association, National Electrical Contractors and Traders' Association, Ltd., and National Federated Electrical Association) in the morning, and a reception by the president at the Grand Hotel in the evening of the first day. Features of the second day will be the annual general meeting, a civic welcome, and the delivery of the presidential address (by Mr. H. Willoughby-Ellis) in the morning, a paper by Mr. C. H. Flower on "The Future of Electrical Contracting" in the afternoon, and a smoking concert in the evening. The fixtures for the third day include: a paper on "Specifications and their Problems," by Mr. W. Cross; the installation of, and a short address by, the new president; a garden party; and a ball and supper at the Grand Hotel.

Legal.

System change-over and Protection.

AT Middlesbrough Police Court on May 7th four retail firms were charged with having failed to take precautions to prevent metal or other conductors from becoming electrically charged. They all admitted a technical offence.

Mr. W. E. HARDING, H.M. Inspector of Factories, said that the cases were important to users of electricity, and they had been brought as much as anything to draw the attention of the users of electricity to their liability in this respect. Some two years ago the Middlesbrough Corporation changed over from supplying d.c. to a.c., and this resulted in making electrical plant which previously had been quite safe dangerous within the meaning of the Act. In order to comply with the Act it was necessary to see that the metal parts of the equipment were properly earthed to prevent the possibility of anyone getting a shock in case of leakage of current. In one case an electric light switch was not properly earthed; in two other cases the metal parts of a lamp did not comply with the Act; and in another the metal parts of some hoist gear were concerned.

For the defendants it was stated that when the plant was installed it was perfectly safe, and they were not aware it did not comply with the Act. One firm added that certain alterations had been carried out by the workmen of the Corporation, and it was naturally assumed that they had left everything in order and made the plant safe.

In imposing nominal fines of 1s. in each case, the Stipendiary Magistrate said it seemed very unfair that the Corporation could change the supply as it wished, for its own profit, and cause consumers to go to the trouble and expense of altering their plant to comply with the demands of the Act.

Mr. NICHOLSON, assistant solicitor to the Corporation, said that when the change was made the Corporation advertised in the Press that it would pay reasonable costs for any changes that might be necessary. It was under no obligation to make the changes itself, but was willing to pay for their being carried out.

The Stipendiary said that even so, there was no indication to the consumer that his plant did not comply with the Act. So far as he knew there was nothing to tell him the difference between d.c. and a.c., or whether any particular part of his plant complied with the Act or not.

Morgan Crucible Co., Ltd.

IN the Chancery Division, before Mr. Justice Maugham, on May 6th, an order was made sanctioning a scheme for the reconstruction of this company, under which a new company with the same name will be formed, with a share capital increased to £3,258,000. As reported in the *Financial Times*, Mr. LIONEL COHEN, K.C., who supported the petition by the company, said the company had been extremely successful, having built up large reserves and made adequate provision for depreciation. It now desired to place its capitalisation on a basis which approximated more nearly to the true value of the assets, having regard to their profit-earning capacity. In sanctioning the scheme, the Court made an order that the present company be deemed to be dissolved without winding up two months after the formation of the new company.

Marconi's Wireless Telegraph Co., Ltd., v. Various Defendants.

LAST week, before Mr. Justice Branson, sitting without a jury in the King's Bench Division, the action in which the Marconi Company sued a large number of defendants (Messrs. Newman & Baynes, W. H. Cork, H. F. Gidden, and others) to recover £3,261 by way of royalties under a licence of May 6th, 1928, respecting the sale of certain wireless apparatus. All of the defendants denied liability. According to the *Financial Times*, Sir WALTER SCHWABE, in opening the case, explained that Mr. W. H. Cork, one of the defendants, was the inspector appointed under a deed of arrangement by the defendants, Newman & Baynes, in September, 1928. The other defendants were the committee of inspection. Defendants Newman and Baynes were in the business of the manufacture and sale of wireless sets under the name of the Langham Radio, in partnership, as successors of a Mr. Havercroft.

The hearing stands adjourned until May 20th.

Electric Fire Patent.

THE hearing was continued on Friday last before Mr. Justice Luxmoore in the Chancery Division of the action by the "Inventum" Company, of De Bilt, Holland, against Mr. S. Schneider, of Hanover Court, Moor Lane, E.C., for an injunction restraining the defendant from importing and selling electrical heating apparatus constructed substantially in accordance with the plaintiffs' patent No. 113,623.

The defendant denied that the apparatus he dealt with infringed the plaintiffs' patent, and he alleged that the patent was invalid by reason of prior publication, and common general knowledge. Evidence was given on both sides in support of their respective contentions, the witnesses including Mr. W. H. Ballantyne (plaintiffs) and Mr. H. A. Gill (defendant).

Mr. LIONEL HEALD submitted the arguments on behalf of the defendant, and Mr. SHELLEY replied for the plaintiffs.

On May 12th Mr. Justice Luxmoore reserved his judgment.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

The B.E.A.M.A. and the Universities.

It is now more than four weeks since the publication of the letter with which I started this discussion. I there offered to show the B.E.A.M.A. Council how English electrical engineers could soon be brought up to the scientific level of their American competitors. No member of the Council has yet asked me to do so. If they have all been waiting to see how the discussion goes on, I think they should now be convinced that the present state of things is at least as bad as I suggested.

The attitude adopted by our great Universities is quite in accordance with their traditions. In the old times, they greatly hindered mathematical progress in this country by refusing to adopt Leibnitz's method of dealing with the calculus. At the present time, they are hindering our progress in electrical engineering by refusing to adopt Steinmetz's "symbolic method," or by failing in their attempts to make it understood.

In the preface to his book on *Alternating Currents*, the Professor of Engineering Science at Cambridge says: "The symbolic method has been found by the author to appeal to a very limited number of students, and hence has not been used." My own experience has proved that any young student will be keenly interested in this method if it is properly explained to him, and that he can then deal with important matters that would otherwise be beyond his comprehension. If Cambridge University does not possess a man who can make the method appeal to students in this way, it ought to see about getting one. I am afraid, however, that the Cambridge tradition would make this course impossible.

In the first paragraph of his letter in your current issue Mr. B. Wood implies that the subject of maxima and minima was understood at our Universities before I said anything about it. But his second paragraph shows that he himself does not understand it even now. This is made clear by his remark that my rule fails when applied to the function x^5 at the point where x is zero. Actually, as I have demonstrated, that rule cannot fail in any case whatever. Applied to the case in question, it first tells us that x^5 will be a minimum if x^4 is, and then tells us that x^4 is a minimum because x^3 is. Here, then, my rule agrees with Professor Hardy's. Indeed, as Mr. Wood ought to have seen, these rules are two ways of expressing one and the same fact, though mine is easier to remember and frequently easier to apply.

The proofs of these rules, however, will be found to differ enormously. Mine is extremely simple, while Professor Hardy's is extremely difficult. Possibly this is why some professors have doubted the rule that he gives. Professor John Perry and Professor R. H. Smith even thought they had disproved that rule in their books on the *Calculus for Engineers*. So did Dr. Steinmetz in his *Engineering Mathematics*, and Mr. G. W. Caunt, M.Sc. (one of the Durham University lecturers in mathematics) in his *Infinitesimal Calculus*.

Mr. Wood, then, cannot maintain that the matter has always been a simple one. I am not aware that it became a simple matter until about fifteen years ago, when I first gave the rule and demonstration that are repeated in my last letter. Some of our Universities are still teaching the incorrect rule,

and none of them has adopted my simple method of proving the correct one. They all seem to have a conscientious objection to learning anything from outside. That is why their students of electrical engineering are so far behind those in America.

W. F. Dunton.

Manchester, *May 11th*, 1930.

Paragraph (2) of Mr. Dunton's letter last week affords the justification for the first two of my observations quoted by him. With respect to paragraph (3) the use of a term in a restricted as well as in a more general sense is sufficiently usual to need no comment.

S. Whitehead.

London, *May*, 1930.

Australian Tariff Effects on Electrical Merchandise.

I wonder if buyers of goods in Australia—the consuming public—really know what it costs them for the highly prohibitive and protectionist tariff on goods imported. As examples, take the following from actual costs:—

Article "A," made in England:—

	1920. No factory in Australia.	1928. Two Manufacturers in Australia.	1930. Several factories in Australia.
	£ s. d.	£ s. d.	£ s. d.
Price charged by British manufacturer on steamer, London, packed for export	106 0 0	102 0 0	100 0 0
Freight to Australia, paid in England	3 0 0	2 15 0	3 15 0
Exchange, sight draft bank charge	1 10 5	1 16 7	7 15 7
	110 10 5	106 11 7	111 10 7
Wharfage, cartage, harbour dues, customs entries, in Australia	15 2	17 3	19 9
Landed cost, Australia	111 5 7	107 8 10	112 10 4
Customs duty	11 13 2	28 1 0	154 10 0
Total	£122 18 9	£135 9 10	£267 0 4
Manufacturers' agents' commission	5 6 0	5 2 0	5 0 0
Cost to the Australian wholesale importer	128 4 9	140 11 10	272 0 4
Profit to wholesaler	(15%) 19 4 9	(15%) 21 1 9	(10%) 27 10 0
Price to trader	147 9 6	161 12 7	299 10 4
Profit to retailer	(10%) 14 15 0	(10%) 16 3 5	(10%) 29 19 2
Cost to user	£162 4 6	£177 16 0	£329 9 6
The British consumer's price was	124 0 0	119 0 0	117 10 0
The Australian consumer paid more by	38 4 6	58 16 0	211 19 6
Extra costs for all charges from British manufacturer to Australian consumer	56 4 6	75 16 0	229 9 6
Per cent. on f.o.b. London price	53%	74.5%	229.5%
Price of Australian-made article to consumer	——	185 0 0	220 0 0

Article "B," sold to an Australian Government:—

	1924. No factory in Australia.	1929. One factory in Australia.
	£	£
F.o.b. London price	20,000	——
C.i.f.e. delivered Australia	20,400	20,800
Duty	——	7,700
Tender price, including agents' commission	(1%) 20,604	(1%) 28,550
Increase due to factory established and protection and increased exchange	——	38.5%
If agents' commission had been the same the extra cost to Australia for a few men employed would be	——	8,150=39.5

Parler.

London, *May 6th*, 1930.

Low-speed Meters.

Some makers are now putting low-speed a.c. meters on the market running at 12 and 20 r.p.m. Advocates claim that low-speed meters are most advantageous, as they involve less wear and tear and are also more accurate. Other people say that such low speeds are quite a mistake, as the meters take an abnormal time to test at low loads, and that, in every respect, the low-speed meter is less satisfactory than the meter which runs at 40 r.p.m. The opinions of users generally on this important subject would be much appreciated.

Meter.

May 7th, 1930.

Marine Lighting.

Will any correspondent versed in marine lighting be good enough to inform me whether it is practicable to illuminate, by means of a gasfilled lamp in a suitable projector, a barrel painted white and fixed on a pole half a mile out at sea. Particulars of the lamp wattage and the projector would be appreciated.

Inquirer.

May 7th, 1930.

The Sales Engineer's Task.

Mr. S. G. Burdick in his article under the above heading deals with a vital aspect of the duties of a sales engineer when he refers to the necessity for the establishment of a cordial relationship between the consumer and the supply undertaking.

Whilst I am in entire agreement with this view, I would stress that this relationship should not be confined to a department; rather should it be established between the consumer and the supply undertaking as an entity. In the letter that Mr. Burdick advocates should be sent to new consumers reference is made to "my department." It must be recognised that departments are set up as a matter of internal convenience, and consumers should be encouraged to look for service from the undertaking as a whole and irrespective of departments.

The last paragraph of Mr. Burdick's article is unfortunate and is not in the interests of the industry, or in accordance with the facts. My own experience is that every effort is made to understand and sympathise with the consumer's point of view, and that we are building up a goodwill and heritage to be envied by small tradesmen and multiple shops alike.

May 8th, 1930. **C. F. W.**

The Federation of Electrical Associations.

Every new idea appears to suggest another association! Why add to the present chaos? Why not reorganise?

The Institution of Electrical Engineers possesses quality and numerical strength, but unfortunately it is not a trading concern, and can do nothing outside the strict limits of its own functions. It offers no protection to the student, who has to accept employment on whatever terms he can make, oftentimes at a salary lower than those paid to workers in organised professions.

The Electrical Contractors' Association (Inc.) is not a trading concern; this accounts for two kindred limited companies and more confusion.

Colleges and other educational centres have little or no connection with industry. Young enthusiasts float into the business alongside the trained technician on equal and precarious terms.

Established firms with interests as wide as the poles are apart adopt electricity impartially.

Skill, qualifications, trade agreements, and the like, are not of much avail. Price is paramount!

Employment generally is in a stage of transition; the workless drift into the electrical industry because "it is a coming thing," or because "there is money in it," or for some other mythical reason.

Many changes have crept in—maybe unawares. There are others to follow, but not by preconceived design yet.

It is true that thousands of pounds are spent nowadays on advertising electricity, but as many thousands are soaked up in divers methods and pettifogging regulations.

The industry is tired of social functions; there are too many gatherings of this description. Always the same people, same talk, and the same shuffle of cards!

Hatching penalties for transgressors cuts no ice. Filling waste-paper baskets with slogans creates much litter. Commercial secrecy should be out of date, but is it?

A society to cover the whole ground is wanted; a company controlling a large number of establishments is in the position to get straight to the point when a branch cannot. Good management at headquarters is the secret of success where expensive management at branches proclaims failure.

Instead of "beating the air" as separate units, federate the various associations under a highly-paid organiser, or, in other words, commercialise the sanctuary on a national basis.

L. E. Wilson.

Manchester, *May 5th*, 1930.

Electric Cable Jointing.

In reply to "Mains Engineer," I suggest that he endeavour to obtain through any good bookshop or publisher the books as undernoted, *viz.*, *Electric Mains and Distributing Systems*, by Dick and Fernie, and the *Art and Craft of Cable-jointing*, by C. G. Watson. These books are the finest books on the subject I know, and I commend them to any mains man who may be interested.

Tillietudlem.

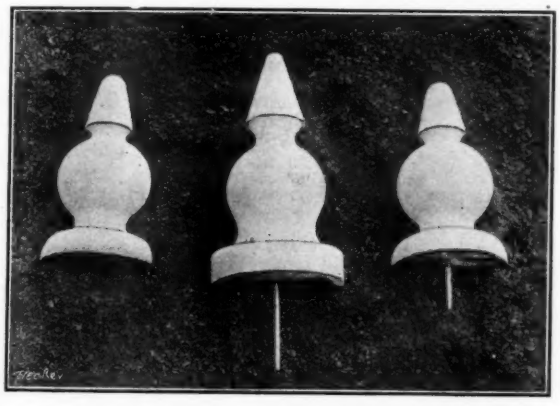
May 10th, 1930.

[In our last issue the pen-name of our correspondent was given as "Tillie Dudhem," a rendering in accordance with our interpretation of his manuscript. Our correspondent also states that the reference, at the beginning of the second paragraph of his previous letter, to the "wiping of a joint" should have been to the "wiring of a joint."—EDS. ELEC. REV.]

Rural Amenities.

With reference to the articles and correspondence on the above subject, overhead lines can be improved by using ornamental pole finials instead of galvanised pole roofs.

Wood finials are costly and liable to split and rot, and cast-iron finials are very costly and require occasional painting. I have therefore induced a local firm of reinforced-concrete



Reinforced-concrete Finials for Wood Poles.

specialists to make finials of reinforced-concrete. They are cheap (2s. to 3s. each, according to size of pole), imperishable, and do not require painting. They can be coloured in manufacture if desired. They are made to suit wood and tubular steel poles.

Finials for wood poles are reinforced with an iron tube through the centre, and are fixed by an iron rod driven vertically into the top of the pole, over which the finial drops, or, if preferred, they can be reinforced with an iron rod through the centre which drops into a hole bored vertically in the top of the pole. The finials for steel tubular poles are made to drop into the top of the pole. All patterns have a lip formed on the bottom edge to shed the rain off the pole.

Arch. J. Howard.

Taunton, *May 5th*, 1930.

The Lighting of the House of Commons.

The interesting experiments in lighting and diffused illumination in the House of Commons are certainly an improvement, particularly in the corridors, but even now, in my opinion, it does not equal the excellent lighting of the Chamber of the London County Council offices. I sat in the gallery of the L.C.C. Chamber a week or so ago and listened to a debate, and I could distinguish people quite well from a gallery which is higher than that of the House of Commons. In my opinion the lighting of the House of Commons could be considerably improved by cornice lighting from under the gallery, throwing the rays of light upon the members. It is very difficult for a visitor who only knows the faces of our politicians from newspaper reproductions in days when the personnel of the House of Commons is so rapidly changing to pick out faces from the gallery. After all, the chief pleasure and advantage oftentimes of attending the House of Commons is not to hear the speakers, but to see their faces, particularly now that there is a number of lady members. The glareless system with concealed units is an enormous advantage and it certainly does give a pleasant daylight effect. Doubtless, too, it has a soothing effect upon members, and the result should be that glareless light would improve debating.

W. Tudor Davies.

London, E.C.4, *May 6th*, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

19,729. "Electrical apparatus for signalling information relating to trains or the like." A. E. White (E. G. Godfree). October 8th, 1928. (327,944.)

29,329. "Electric signalling systems for repeating the indications of measuring instruments." Akt. Ges. Brown, Boveri et Cie. October 11th, 1927. (298,577.)

30,868. "Cascading of induction and commutator dynamo-electric machines." Maschinenfabrik Oerlikon. November 15th, 1927. (300,577.)

32,950. "Vacuum switches." Siemens-Schuckertwerke Akt. Ges. November 18th, 1927. (300,649.)

32,978. "Automatic devices for maintaining a constant electrical pressure or line voltage." Whipp & Bourne, Ltd., and F. Whipp. November 12th, 1928. (327,947.)

36,467. "Telephone installations." Siemens & Halske Akt. Ges. June 23rd, 1928. (314,042.)

36,599. "Apparatus for the electric transmission of indications, such as train descriptions and the like." L. H. Peter. E. W. Challans, and Westinghouse Brake and Saxby Signal Co., Ltd. December 11th, 1928. (328,031.)

36,680. "Manufacture of light-emitting elements for electric lamps." Dr. A. Schmid and Metropole Developments, Ltd. December 12th, 1928. (327,951.)

36,855. "Arrangement and support for electric pick-ups in gramophones." Automatic Musical Instrument Co. July 28th, 1928. (316,279.)

1929.

480. "Therapeutic lamps." Burdick Corporation." January 6th, 1928. (303,524.)

993. "Electric fuses." C. W. Cox, C. E. C. Shawfield, and J. A. Welch. January 11th, 1929. (327,961.)

1,022. "Luminous tubular electric signs." F. H. Wingrave. January 11th, 1929. (327,963.)

1,195. "Means for measuring electric power." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). January 12th, 1929. (328,035.)

1,267. "Electric clock systems." H. E. Warren. January 24th, 1928. (304,690.)

1,336. "Electrical connections of the plug-and-socket type." A. West and Co., Ltd., and A. West. January 14th, 1929. (328,006.)

1,342. "Electrical speed-regulating apparatus." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). January 14th, 1929. (328,036.)

1,369. "Electric couplings." A. C. Wynne. January 15th, 1929. (327,993.)

1,373. "Electric protective arrangements." A. Reyrolle & Co., Ltd., and E. W. M. Scott. January 15th, 1929. (327,994.)

1,465. "Sound recording." Western Electric Co., Ltd. (Electrical Research Products, Inc.). January 15th, 1929. (327,998.)

1,480. "Apparatus for graphically illustrating the variation in the product of two sinusoidal alternating magnitudes of equal frequency, in accordance with variation of phase relationship between the said magnitudes." H. E. Dance. January 16th, 1929. (328,010.)

1,527. "Variable electric condenser." Standard Telephones and Cables, Ltd. (F. de Fremery). January 16th, 1929 (328,016.)

1,577. "Electric motors for driving rotary apparatus." G. M. Wright. January 16th, 1929. (328,019.)

1,578. "Means for driving rotary apparatus by electric motors." G. M. Wright. January 16th, 1929. (328,020.)

1,597. "Generation of pulsating electric current." Automatic Telephone Manufacturing Co., Ltd., and M. O. Williams. January 16th, 1929. (328,024.)

2,470. "Junction box for electric cables." Siemens Bros. & Co., Ltd., and W. M. Craufurd. January 24th, 1929. (328,046.)

2,589. "Method of and means for testing thermionic valves." Baron Marks (Western Electrical Instrument Corporation). January 25th, 1929. (328,049.)

3,202. "Electrolytic processes." K. Breusing and Dr. U. Gottesmann. January 30th, 1929. (328,057.)

3,618. "Temperature-responsive circuit-controlling device." American Fire Prevention Bureau. April 11th, 1928. (309,481.)

5,379. "Long-duration arc lamps." Siemens-Planiawerke Akt. Ges. für Kohlefabrikate. November 16th, 1928. (328,071.)

5,809. "Electric fuses." C. R. Bates. February 21st, 1929 (328,072.)

9,308. "Manufacture of active masses for electric accumulators." O. Y. Imray (I. G. Farbenindustrie Akt. Ges.). March 22nd, 1929. (328,086.)

11,450. "Multiple thermionic valve." Dr. S. Loewe and Dr. E. Romhild. April 14th, 1928. (309,608.)

12,357. "Radio-receiving systems operating in conjunction with a.c. mains." H. V. Carlisle and Ferranti, Ltd. April 20th, 1929. (328,117.)

12,643. "Automatic or semi-automatic telephone systems." Coventry Automatic Telephones, Ltd., and C. W. Wilman. April 25th, 1929. (328,120.)

13,445. "Method of and apparatus for salvaging storage battery plates." C. B. White. April 30th, 1929. (328,123.)

14,874. "Guide for the current-supply cable of electric irons." B. Quendt. May 13th, 1929. (328,131.)

15,034. "Telephone and like cables." Siemens-Schuckertwerke Akt. Ges. and E. Fischer. May 14th, 1929. (328,133.)

15,181. "Means for connecting telephone cables." F. Renyard. May 15th. 1929. (328,135.)

15,718. "Electromagnetic relays more particularly for telephone plants." Osterreichische Telephon-Fabrik- Akt. Ges. vorm. J. Berlinger. May 19th, 1928. (312,172.)

17,563. "Method of producing oscillations from piezo-electric plates." Kolster-Brandes, Ltd. (Kolster Radio Corporation). June 7th, 1929. (328,152.)

18,734. "Control of high-frequency generators." E. Asch. July 5th, 1928. (Addition to 300,511.) (314,946.)

19,246. "Method of attaching a wire to a contact or terminal." C. L. B. De Saunter. July 3rd, 1928. (314,862.)

25,625. "High-frequency generators and transmitters." Telefunken Ges. für Drahtlose Telegraphie. October 15th, 1928. (328,180.)

30,152. "Coil piece for submarine cables." Siemens-Schuckertwerke Akt. Ges. October 6th, 1928. (328,187.)

1930.

2,802. "High-voltage rectification." Ferranti, Ltd., and V. Z. De Ferranti. July 23rd, 1929. (Divided application on 325,528.) (Patent addition not granted.) (328,188.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 7th :—

Dexim. No. 511,774. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex.

Liver. No. 508,132. Class 17. Goods for electrical purposes manufactured from mineral and other substances.—The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Lancs.

Summit. No. 511,600. Class 18. Electric fires.—H. Frost & Co., Ltd., 35, Fieldgate, Walsall.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ASHTON-UNDER-LYNE.—School (£24,250) for the borough E.C.; Percy Howard, architect.

BARNSLEY.—Showrooms and offices, Eldon Street, for the T.C.; borough surveyor, Municipal Offices, Dale Street.

BATH.—Reconstruction of statutory hospital (£41,699); F. J. Amery & Sons, Ltd., builders. Central premises for the Co-operative Society; L. G. Ekins, C.W.S. architect, Balloon Street, Manchester.

BEXHILL.—Houses; Tubbs & Messer, E. Bunce, and J. E. Maynard.

BIRKENHEAD.—Elementary school, Dell estate (£25,302); E. B. J. Gould, Ltd. Central school, Tollemache Road, for the E.C.

BIRMINGHAM.—Elementary schools, Tedbury Crescent (£19,400), Kelby Close (£50,300), and Warstock Lane, for the E.C. Extensions, Selly Oak Hospital (£17,500); city engineer. Extensions, maternity home, Moseley; Jacombs & Sons, Ltd. Headquarters for municipal bank, Broad Street; bank committee. Stores, West Bromwich, for Marks & Spencer; Bovis, Ltd., builders, 43, Upper Berkeley Street, London, W.1. Premises, Spiceal Street; F. W. Woolworth & Co., Ltd.

BLACKBURN.—Houses (244) for the T.C.; borough surveyor.

BOLTON.—Estate development, off Woodbine Road; Sir W. R. Hulton. Estate development, off Sharples Avenue; executors of Sir John Holden. Houses (550) and shops (10), Hall in the Wood; borough engineer.

BRISTOL.—Re-erection of cabinet-making works, Portland Square, for A. W. Smith.

BURY (Lancs.).—Housing scheme (100) for the T.C.; John Chadwick, borough engineer (returnable deposit of £3).

CAMBRIDGE.—Administration buildings (£43,352) for Cambs. C.C.; C. Kerridge, builder.

CHELMSFORD.—Public library, municipal offices, and Council chamber for the T.C. (£30,000); borough engineer.

CHERTSEY.—Colony for 1,500 mental defectives for Surrey C.C.; J. M. Sheppard, architect, 38, Bedford Place, Blomsbury Square, London.

CHESTERFIELD.—Pipe foundry, Staveley, for the Staveley Coal and Iron Co., Ltd.; D. N. Turner, managing director.

CLEVELEYS.—County branch library for S. Lancs. E.C.; S. Wilkinson, architect, 16, Ribblesdale Place, Preston (returnable deposit of £2).

COLCHESTER.—Elementary school, Mersea Street, for the E.C. Alterations, East Mills; Brown & Burgess. Cinema, Crough Road; Cecil Masey, architect.

DERBYSHIRE.—Schools and extensions (£850,000) for the E.C.; director of education, Derby.

DUMFRIES.—Cinema for Scottish Cinema and Variety Theatres, Ltd.; manager, The Playhouse.

DUNDEE.—Fire station for Corporation (£7,000); city architect.

DURHAM.—Schools, Eden Castle (£11,000), and East Rainton (300 places); county education architect, Old Elvet. Village settlement at county sanatorium; county architect, Old Elvet.

ENFIELD.—Houses (146) for U.D.C., on Suffolks estate; H. R. Crabb, surveyor.

ESSEX.—Schools, Clacton-on-Sea (£21,698), Tilbury, Chelmsford, and Hornchurch, and extensions at Leyton (£16,130) and Epping (£6,131) for the E.C.; director of education, Chelmsford.

FELTHAM.—Houses (200), Hanworth and Bedfont; H. W. A. Carter, surveyor.

GLASGOW.—Factory, Cathcart, for J. and A. Ferguson, Ltd.; the manager.

HART HILL (Lanarkshire).—Re-erection of cinema for Wright Bros.

HERTS.—Schools, Barnet, Rickmansworth, Croxley, and London Colney; and conversion of old Hertford Grammar School to elementary school (£3,000) for County E.C.; county surveyor, Hatfield. School, Hemel Hempstead, for county E.C.; W. J. Kieffer, architect, 83, Pall Mall, London, S.W. (returnable deposit of £1 1s.).

HOVE.—Re-erection of sheet-metal works, Mortimer Road, for C. Hounslow & Co.

IRVINE.—Extensions, Royal Academy (£30,000); secretary.

KENT.—Schools, Sidcup, Minster-in-Sheppey, Sittingbourne, and Tonbridge, for the E.C.; director of education, Maidstone. Central school, Ashford (£39,480), for the E.C.; J. B. Barton & Co., builders, Tankerton, Whitstable.

KIDDERMINSTER.—Dye house, Franchise Street, for Dutfield & Quayle. Works extensions, Mill Street, for Carpet Trades, Ltd.

LANCS.—Schools, Radcliffe (£46,000), Black Moss, Prestwich (£31,500), and Whitefield; director of education, Preston.

LEEDS.—Cinema, The Headrow; Samuel Scott. Buildings, New Briggate and The Headrow; Shaftesbury Trust, Ltd. Five blocks, Meanwood Mental Colony; city architect.

LEICESTER.—Junior school, Coleman Road (£11,181), and infants' school, Braunstone estate (£11,540), for the E.C.

LONDON (Ilford, E.).—Library, Hamilton Road; borough engineer.

(Catford, S.E.).—Telephone exchange, Bromley Road; H.M. Office of Works.

(Sydenham, S.E.).—Cinema, Sydenham Road and Girton Street; N. Hart.

(Lewisham, S.E.).—Alterations, King's Hall Cinema, High Road; Kirk & Kirk, Ltd.

MANCHESTER.—Library, Wilbraham Road; city architect.

MELKSHAM.—Housing scheme (32) for the U.D.C.; Mr. Pearce, architect.

NEWCASTLE.—Elementary school (1,400 places), Wharrier Road, for the E.C.

OLD FLETTON (Peterborough).—Factory extensions, with duplication of plant, for the Central Sugar Co.

OSSETT.—Houses (42), Spa Street; J. Illingworth.

OXFORD.—Ice rink, Botley Street, for Oxford Rink Co., Ltd.; J. R. Wilkins, architect.

RAMSGATE.—School (£25,000) for the borough E.C.; director of education.

REIGATE.—Firemens' flats (£5,000) for the T.C.; borough surveyor. Houses, with electrical work; County Estates Development Co. and Hayden & Randall.

RIPON.—Housing scheme (34) for the T.C.; city engineer.

ROTHERHAM.—Houses (40), Wickersley, for J. C. Lister, Listerdale.

ST. ALBANS.—Mental colony, Cell Barnes; Herts. C.C.

SALFORD.—Houses (36), Pendleton estate (£11,882); J. Gerrard & Sons, Ltd., Swinton.

SANDERSTEAD.—Development of Downs estate, Sanderstead Hill; H. P. Hawkes.

SHARDLOW.—Housing scheme (194) for the R.D.C.; H. Tatham Sudbury, architect, Rutland Chambers, Lord Haddon Road, Ilkeston (returnable deposit of £2 2s. for each of 13 sites).

SHEFFIELD.—Houses (122), Shiregreen estate (£43,056); M. J. Gleeson, Ltd.

SHIPLEY.—Development of Nab Wood estate; Wm. Pitts and Sons. Housing scheme, Windhill; U.D.C. surveyor.

SMETHWICK.—Baths, with public hall, &c., Bearwood (£59,964), for the T.C.; Capt. R. Fletcher, borough engineer.

TORQUAY.—Development scheme, including winter garden and concert hall (£150,000), for the T.C. Development of Shiphay Manor estate; Easterbrook & Gilley. Housing scheme, Barton estate; borough engineer. Bank, Fore Street, St. Marychurch; Barclays Bank, Ltd.

WALSALL.—Houses (71), Chucker estate (£23,452); L. G. Peace. Technical college, Darwell Road, for the E.C.

WORKSOP.—Ward block, Victoria Hospital; Leverton and Brown, builders, Watson Road.